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A Proposal for an International System of Fits Developed under ISA Procedure

by

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American Standards Association

A report prepared for the information of the ASA Sectional Committee on Allowances and Tolerances for Cylindrical Parts and Limit Gages (B4)

A proposal of an international system of fits between cylindrical parts has been developed under the procedure of the International Standards Association (ISA). One of the main purposes of the ISA—a federation of national standardizing bodies—is to avoid or to eliminate differences between national industrial standards on the same subject in cases where this appears to be feasible and desirable. The proposals or recommendations developed under ISA procedure are intended to serve as a common basis for the establishment of national standards in the countries concerned, but not as formal international standards to which the participating countries are bound to adhere.

The ISA proposal on Fits—as it will briefly be called here—was recently submitted to all national standardizing bodies affiliated with the ISA, for their consideration. Including the American Standards Association (ASA), there are 18 of these bodies representing the industries in the following countries:

Austria	Italy
Belgium	Japan
Czechoslovakia	Norway
Denmark	Poland
Finland	Roumania
France	Russia
Germany	Sweden
Holland	Switzerland
Hungary	United States

Each of these national bodies is expected to state its attitude as to whether the ISA proposal is acceptable to the industry in its country. In order to determine this question in so far as American industry is concerned, ASA has decided to refer the ISA proposal for advice to the Sectional Committee on Allowances and Tolerances for Cylindrical Parts, and Limit Gages (B4), as the representative American group in the field concerned. Such comments, suggestions, criticism, or counter-proposals as the sectional committee wishes to formulate will be transmitted by ASA to ISA Technical Committee 3 on Fits. A similar procedure will be followed by all national bodies affiliated with the ISA and it is hoped that further discussion will ultimately lead to an international recommendation acceptable to all countries.

The ISA proposal sets forth the essential features of the system recommended for international adoption and, furthermore, gives numerical values for the manufacturing limits of the standard holes and shafts proposed, thus also laying down the allowances of the fits obtained when standard holes and shafts are mated.

The present report is confined to an explanation of the essential features of the ISA proposal. In fact, consideration by the sectional committee of the specific numerical values for the tolerances on holes and shafts will become necessary only if and when agreement on the fundamentals of the proposed system has been reached between the different countries concerned. Furthermore, ASA has been requested to submit a statement on behalf of American industry at an early date, and it seemed, therefore, advisable to expedite the submission of this preliminary report. It will be followed, as soon as this appears to be desirable, by a report or reports on details of the proposed system, such as tables giving the numerical values of the manufacturing limits of the standard holes and shafts proposed.

The recommendations contained in the ISA proposal are supplemented in this report by statements of fact concerning the situation in the United States. These statements have been added for the purpose of clarifying the presentation of the case with special regard to American conditions.

In general, the discussion in the present report of each of the several items contained in the ISA proposal proceeds along the following lines:

Statement of the recommendation made in the ISA proposal

Reasons on which the recommendation is based

Statement regarding practice recommended

by the American Tentative Standard B4a-1925, on Tolerances, Allowances, and Gages for Metal Fits, now under revision

Further statements, if any, relative to American practice

History of ISA Proposal

The basis for the International Standards Association was laid at an international conference held in 1926 in New York between delegates of 18 national standardizing bodies. At a technical conference regarding national standard systems of fits held on that occasion, it was agreed that unification of the several existing systems appeared to be desirable and feasible. Pending the formal establishment of the ISA, an international technical committee was appointed, whose secretariat was entrusted to the German national standardizing body (Deutscher Normenausschuss). The secretariat made an exhaustive survey and a thorough comparative study of all national systems in existence or in course of development. Its voluminous report, illustrated by 50 diagrams and tables and 80 separate large size drawings (graphs), was submitted to all national standardizing bodies in July, 1928.

The results of this comparative study were discussed at an international conference, in Prague, October, 1928, which was attended by representatives of 13 countries: Austria, Czechoslovakia, Denmark, France, Germany, Holland, Hungary, Italy, Norway, Poland, Russia, Sweden, and Switzerland.

The conference came to the conclusion that it would be possible to unify the national systems of fits of the countries represented. It also expressed the wish that the United States and Great Britain should join the ISA work on Fits, and the great value of such participation in regard to world-wide unification was stressed.

A subcommittee composed of delegates from five countries—Czechoslovakia, France, Germany, Sweden, and Switzerland—was appointed to prepare a proposal for an international system of fits. An essential requirement of the new system to be developed was that it must secure interchangeability with the national systems in existence. This strict condition should be remembered in certain cases where slight deviations are found to exist from what would appear to be a perfectly regular set-up.

The ISA subcommittee so far has met five times and the result of its work has been laid down in the ISA proposal of November, 1930, discussed in the present report.

ASA was not yet a member-body of the ISA in 1928—and, therefore, was not represented at the Prague conference referred to above—but it joined the ISA in the fall of 1929. In 1930, the sectional committee (B4) organized in 1920, which had set up the American Tentative Standard B4a-1925 on Tolerances, Allowances, and Gages for Metal Fits, was reorganized, the new name of the project being Allowances and Tolerances for Cylindrical Parts, and Limit Gages. At its first meeting held on December 5, 1930, in New York, the sectional committee decided to give due consideration to the ISA proposal—whose submission was then expected to follow at an early date—and to participate, as far as possible, in the work of ISA Technical Committee 3 on Fits.

The ISA proposal was received by ASA at the end of January, 1931. It is a recommendation made by the ISA subcommittee to the entire ISA Technical Committee 3 on Fits, concerning an international system which, on the one hand, will unify national practices to a sufficient degree to secure interchangeability of fits, while, on the other hand, it will leave the different countries free to decide on such features of their national systems as have no direct bearing on interchangeability.

The ISA proposal deals both with the problem involved in establishing standard fits and with the problem of controlling the latter by means of limit gages. In fact, it makes recommendations concerning both the manufacturing limits for the work (holes and shafts), and the manufacturing limits of gages and their permissible wear.

The members of the ISA subcommittee who developed the ISA proposal, together with the country whose national body they represent, are:

Czechoslovakia—Dr. N. N. Sawin; K. Julis

France—Ch. Le Besnerais; Ch. Luttenauer; P. Nicolau

Germany—Dr. O. Kienzle; Dr. G. Schlesinger

Sweden—H. Tornebohm

Switzerland—H. Zollinger; H. Maier

The secretary of the subcommittee is K. Gramenz (Germany).

The question numbers in the following text correspond with the numbers in the questionnaire which has been sent with a copy of this report to the members of the ASA committee on allowances and tolerances for cylindrical parts and limit gages. The questionnaire is reproduced on page 14.

Question 1

Reference temperature—The ISA proposal recommends that the reference temperature for limit gages and other measuring tools and equipment be 68 degrees Fahrenheit (20 degrees Centigrade).

In 1928, 16 out of 18 countries that answered the questionnaire of the international secretariat, were found to have adopted the reference tem-

perature of 68 F. In France the temperature of 32 F has been generally used so far. However, the French delegates on the ISA subcommittee expressed willingness to change to 68 F if this reference temperature becomes internationally adopted.

The American Tentative Standard B4a-1925 also specifies the temperature of 68 F which appears to have been generally adopted in American industry.

Question 2

Range of Diameters Covered—The ISA proposal covers a range of diameters up to 180 millimeters, or about 7 inches, inclusive. Numerical data of allowances and tolerances were developed for this range first, as it comprises the diameters most frequently used.

The range of diameters from above 180 mm up to 500 or 600 mm, that is, from about 7 inches to about 20 or 24 inches, will be considered later. The national bodies are invited to express their opinion as to whether diameters larger than 7 inches should be dealt with, and if so, whether the range of diameters covered should be extended to 20, or to 24 inches.

Question 3

Subdivision of Range of Diameters—The ISA proposal recommends the following subdivision of the range of diameters up to 180 mm, inclusive:

Millimeters[1]

1	3	6	10	18	30	50	80	120	180

This subdivision was chosen on the basis of the subdivisions that had already been adopted in the national standards of 11 countries.

The inch values very closely approximating the above metric values are:

Inches

0.04	$^1/_8$	$^1/_4$	$^{13}/_{32}$	$^{23}/_{32}$
$1^3/_{16}$	2	$3^1/_8$	$4^3/_4$	$7^1/_8$

The following somewhat more rounded inch values may probably serve equally well as approximate conversion figures:

Inches

0.04	$^1/_8$	$^1/_4$	$^3/_8$	$^{11}/_{16}$
$1^1/_4$	2	$3^1/_4$	$4^3/_4$	7

In fact, the essential requirement in establishing equivalent inch and metric series of this kind is that any specific diameter—whether in inches or millimeters—that is commonly used in practice shall lie within the same subrange in either system. This will be explained here by a concrete sample.

A metric shaft with a diameter of 30 mm belongs to the subrange from 18 to 30 mm, inclusive (see footnote 1). The next larger diameter adopted as a standard diameter in several metric countries is 32 mm. This shaft lies within the subrange from 30 to 50 mm.

As a boundary between the two subranges—18 to 30, and 30 to 50 mm—the value $1^1/_4$ inch, or about 31.75 mm, looks like a suitable practical equivalent of the metric figure 30 mm. The question now arises whether it actually may safely be used as such boundary, or whether difficulties might occur through the values 30 mm and $1^1/_4$ inch falling within non-corresponding subranges. Evidently, if no metric diameter between 30 and 32 mm is used in actual practice, there is no objection to the use of the value $1^1/_4$ inch instead of the closer approximation $1^3/_{16}$ inch. This consideration led to the two series of conversion figures in inches given above.

In determining the equivalent inch and metric subranges, the above question must probably be given careful study. However, this is a detail, the essential questions being whether the fewer number of subranges into which the total range up to 7 inches is divided, and these subranges themselves, would be acceptable to American industry.

In the American Tentative Standard B4a-1925, the range of diameters up to about 7 inches is divided into more than 20 subranges, instead of nine as suggested in the ISA proposal. Objections to these small subdivisions have been raised by firms otherwise applying the American Tentative Standard B4a to their satisfaction. In fact, some firms have reported that they have reduced in their practice the number of subranges by combining adjacent subranges.

Question 4

Relation between Tolerance or Allowance and Nominal Diameter—In developing the ISA proposal, no effort has been made to establish basic formulas expressing the relationship between nominal diameters on the one hand, and allowances or tolerances on the other hand. The ISA subcommittee preferred to base the proposed allowances and tolerances on the numerical values that have been laid down in the existing national systems.

This decision was based on the consideration that the formulas used in building up the existing national systems have been developed on the basis of practical data and do not represent mathematical or physical laws. The formulas used in the several countries vary and there seemed to be no good reason to search first for a method of comparing them, instead of basing directly on the practical data. The soundness of this pro-

[1] The subranges extend from above each figure to the next higher figure, inclusive; for example, the range 30–50 mm covers diameters from above 30 to 50 mm, inclusive.

cedure seemed the more evident, as the numerical values of allowances and tolerances adopted for similar fits in the several national systems are frequently almost, and sometimes even entirely, the same, although they were developed on the basis of different formulas.

The American Tentative Standard B4a-1925 is one of those that have been developed on the basis of formulas for recommended allowances and tolerances, derived from practical data. These formulas are tabulated on page 24 of the standard, which says, on page 23:

> "In the foregoing allowances and tolerances, the best practice available was considered, and where differences occurred, a compromise was attempted."

Question 5

Basic Hole and Basic Shaft Systems—The ISA proposal recommends that the international system should comprise fits in the Basic Shaft System as well as in the Basic Hole System.

This recommendation is based on the consideration that both systems are needed by a national industry considered as a whole, and also on the fact that 13 countries had decided—as shown by the canvass made in 1928—to include both systems in their national standards.

The American Tentative Standard B4a-1925 gives fits in the Basic Hole System exclusively, but the desirability of having fits in the Basic Shaft System added to the standard has been brought to the attention of the ASA office on several occasions, one of these being the reorganization meeting of sectional committee B4.

Question 6

Character of the Tolerances—The ISA proposal recommends the adoption of the nominal size of the mating parts as the zero or reference line, the holes in the Basic Hole System to have plus tolerances, and the shafts in the Basic Shaft System minus tolerances on the nominal size. In a similar way, the tolerances on all other holes and shafts are also measured in one direction from their basic size only. In other words, the adoption of *unilateral* tolerances is recommended.

Two technical advantages are mentioned in the ISA proposal in support of this recommendation. One advantage is that the Go gages are the same for all parts with the same maximum metal limit, whatever their minimum metal limit may be. For example, in the Basic Hole System the same Go plug gage can be used for all basic holes, independent of the numerical value of their tolerance. The other advantage mentioned is that a change in unilateral tolerances requires a shift in the Not Go limit exclusively, whereas a change in bilateral tolerances requires a shift of both limits, Go and Not Go.

Question 7

Set-Up of Proposed ISA System—Before discussing the manner in which the set-up of the proposed international system was developed, it will be necessary to explain the distinction made in several Continental standards between "class" and the "grade" of a fit. The ISA proposal being intended as a compromise between the existing national standards, this distinction was kept in mind by the ISA subcommittee in working out its proposal, although later the distinction between "class" and "grade" of fit was dropped, as will be seen further below.

According to Continental definition, the "class" of a fit depends on the *allowance;* that is, on the minimum looseness of a clearance fit, or the maximum tightness of a transition or interference fit. The "grade" of a fit, however, depends on its maximum permissible *variation* in looseness or tightness. Therefore, if two fits *A* and *B* have the same minimum clearance, but *B* has a larger maximum clearance than *A*, then fit *A* is of a higher "grade" than fit *B*.

The explicit distinction between "class" and "grade" of fit is unusual in American practice. The American Tentative Standard B4a-1925 does not make this distinction, but specifies eight fits completely defined as to the limits of hole and shaft, each fit being designated by a name and a "class" number. The term "class" is not defined in the American standard, but has simply been adopted to distinguish one fit from another. Also, the allowances of the eight fits all being different, there is no particular need, in so far as the American standard is concerned, of distinguishing between different "grades" of fits, nor between the concepts "class" and "grade" of fit, as defined by the Continentals.

It is true, however, that, practically, the American standard permits the cross-mating of holes and shafts and consequently the establishment of fits with the same allowance but with different variation in looseness or tightness; that is, fits of the same "class," but of different "grades." For example, when a Class 3 shaft is mated with a Class 4 hole, the fit thus obtained is of a higher "grade" than when that shaft is mated with a Class 3 hole, while the allowance (minimum clearance), and therefore the "class" of the fits (in the European sense of the word) is the same for both.

While developing its proposal, the ISA subcommittee conserved the subdivision of the fits into grades, each grade comprising a certain number of classes of fits. As will be described later in more detail, four different grades of fits were adopted, the total tolerance on the mating parts being smallest for the finest grade, and so

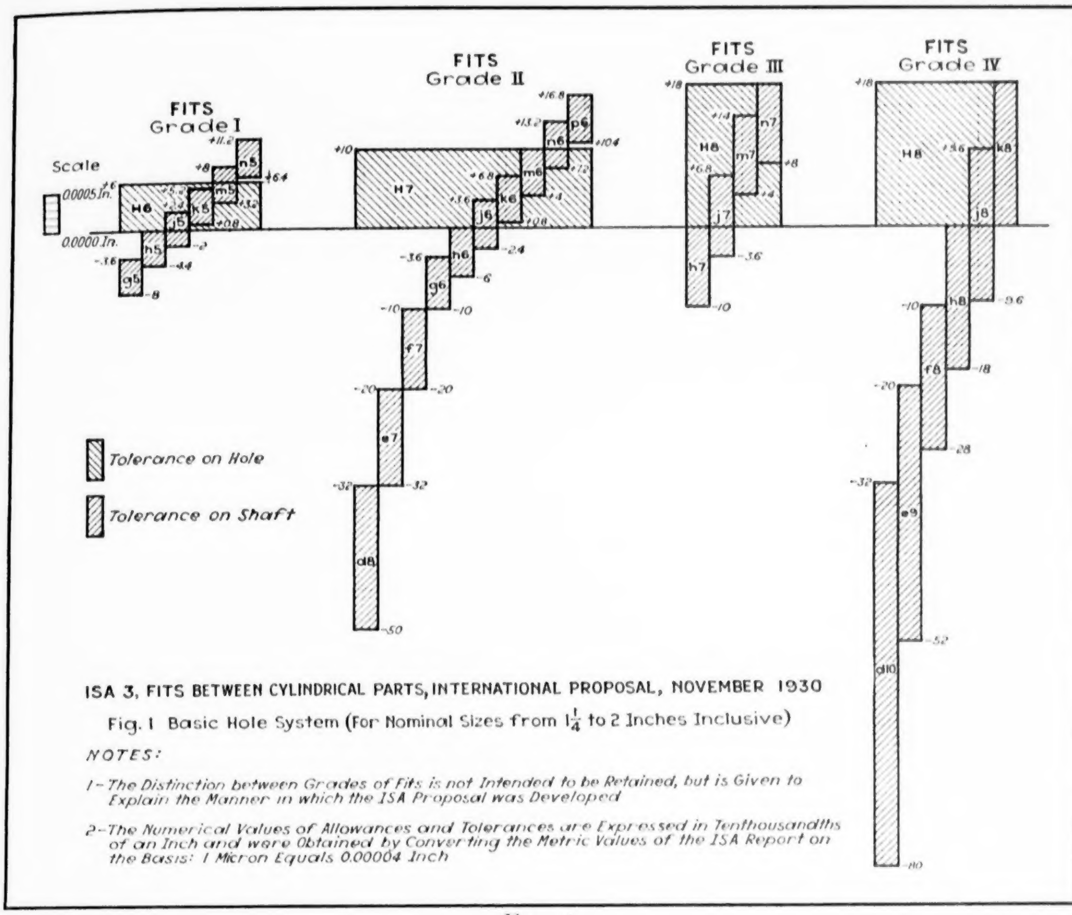


FIG. 1

Basic Hole System

on. It was thus possible to establish a compromise between the existing national systems in which the fits are also subdivided into grades, as already stated.

Once the proposed ISA system had been worked out, the ISA subcommittee decided to abandon the idea of subdividing the fits into grades and classes. Instead, it preferred to group together the standard holes and shafts on the basis of their respective tolerances. Thus, several groups of standard holes and shafts were established, each group comprising holes or shafts with the same tolerance. (To be exact, slight deviations are sometimes found in the tolerances on parts of the same grade. These deviations are understood to be due to the necessity of compromising between existing national systems and not to have any essential significance.)

The above distinction between "class" and "grade" of fit has been conserved in the following discussion, in order better to explain how the ISA proposal resulted from the consideration of the following four major questions:

(*a*) How many grades of fits should be adopted?

(*b*) What classes of fits should be comprised in each grade?

(*c*) What mutual relationship should the different grades have?

(*d*) How should the total tolerance be distributed between the hole and the shaft giving together a fit of a certain standard grade?

Before dealing with these questions, it seems well to visualize the essential set-up of the ISA system by a concrete example in reference to Figures 1 to 4, inclusive. The figures represent the tolerances on standard holes and shafts recommended in the ISA proposal for nominal sizes of from 30 to 50 millimeters, inclusive, or in inch values, from about $1^1/_4$ to 2 inches, inclusive. The range from $1^1/_4$ to 2 inches has been chosen because it covers a series of diameters that are

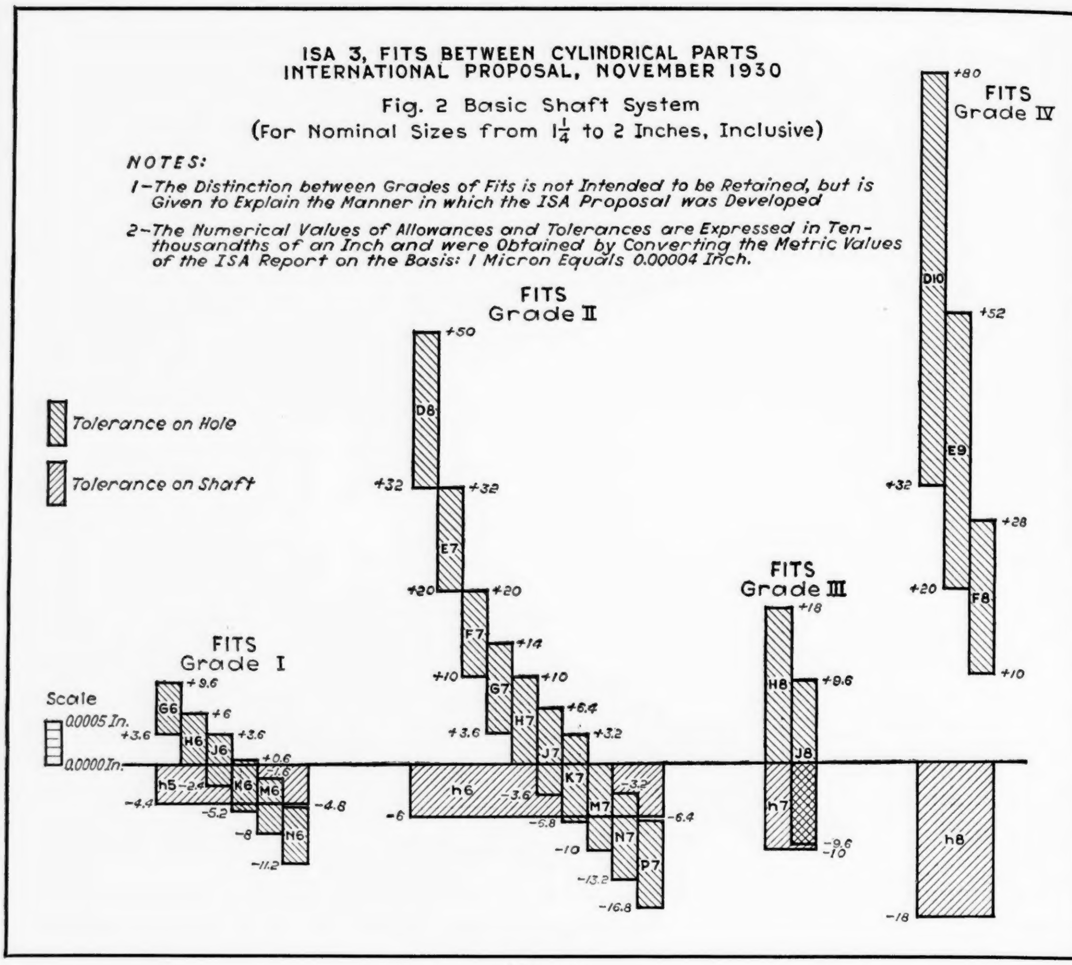


Fig. 2

Basic Shaft System

widely used in different branches of industry. The reference line in Figures 1 to 4 has been assumed to represent the nominal size of $1^1/_2$ inches. The cross-hatched bars represent the tolerances on holes and shafts, the direction of cross hatching indicating whether the tolerance applies to a hole or a shaft.

Figures 1 and 2 represent fits between combinations of the standard holes and shafts. These fits are of different "classes" and "grades," to use the Continental terminology explained above. Figures 3 and 4, on the contrary, show the standard shafts and holes independently, that is, without reference to the fits which they give when mated.

Figure 1 represents a series of fits in the Basic Hole System. The fits are subdivided into four groups, each group comprising fits belonging to the same grade of fit. The Grades of fits, I, II, III, and IV, are thus obtained. The tolerance on the basic hole is constant for each grade of fit. The hole tolerances for Grades I, II, and III are different, but the hole tolerance on the Grade IV hole is the same as that on the Grade III hole. Therefore, three different basic holes cover the requirements of the four grades of fits in the Basic Hole System.

Figure 2 represents a series of fits in the Basic Shaft System. These are also divided into four grades of fits, the shaft tolerance being constant here for each grade. Each basic shaft has a different tolerance, the four grades of fits in the Basic Shaft System consequently being covered by four shaft tolerances.

Figure 3 represents all of the standard shafts that appear in Figure 1. They are arranged here in "grade" groups according to their tolerance. In addition to these shafts, nine standard shafts with large tolerances appear in Figure 3. The latter are not meant to be used in specific hole-shaft combinations as shown in Figure 1, but have been added to take care of special re-

quirements. The tolerance on a Grade 10 or Grade 11 shaft may be suitable also in cases where the shaft is not to be mated with a hole; that is, where no establishment of a specific fit is involved.

The shafts in each group represented in Figure 3 have the same tolerance and are said to be of the same "grade." It should be noted that the term "grade" applies to the magnitude of the tolerance only, and not to the surface finish of the part.

Altogether, seven different grades of shafts are given in Figure 3, designated as Grades 5 to 11, inclusive. The finest grade of shaft has been designated as Grade 5—and not as Grade 1—in order to reserve still finer standard grades—with closer tolerances—for limit gages and for possible future refinement of the entire system.

Figure 4 shows the standard holes given in Figure 2, also grouped into "grades" according to their respective tolerances. There are only six different grades of holes, as against seven different grades of shafts, there being no Grade 5 holes (see Fig. 3). Generally speaking, the fits shown in Figures 1 and 2 occur between a hole of a certain grade and a shaft of the next finer grade.

The tolerances on holes and shafts designated by the same grade number are equal. For example, the $1^1/_2$ inch, Grade 6, shaft h6 in Figure 3, and the $1^1/_2$ inch, Grade 6, hole H6 in Figure 4, both have a tolerance of 0.0006 inch.

The four questions listed above which were given consideration by the ISA subcommittee will now be dealt with:

(*a*) *Number of different grades of fits*—The adoption of the Grades of fits I to IV must be considered as a compromise between the several national systems which in general comprise three to five grades of fits.

The starting point in setting up the ISA proposal was the series of Grade II fits, these being the ones most commonly used by industry in general. Also, there appeared to exist a considerable degree of similarity between this grade of fits, in the several national systems.

Subsequently, the finer grade of fits I, and the coarser grades of fits III and IV were added. Grade I is intended, for example, for precision machine tools, while Grades III and IV will serve, for example, for certain parts of agricultural machinery and railway cars. Incidentally, Grade III is equivalent to the third grade in the Swedish and Czech standards, while Grade IV is equivalent to the German third grade. This clearly shows the changes from the existing systems made in the ISA proposal for the sake of compromise.

(*b*) *Classes of fits in each grade*—The main question to be discussed in this respect was

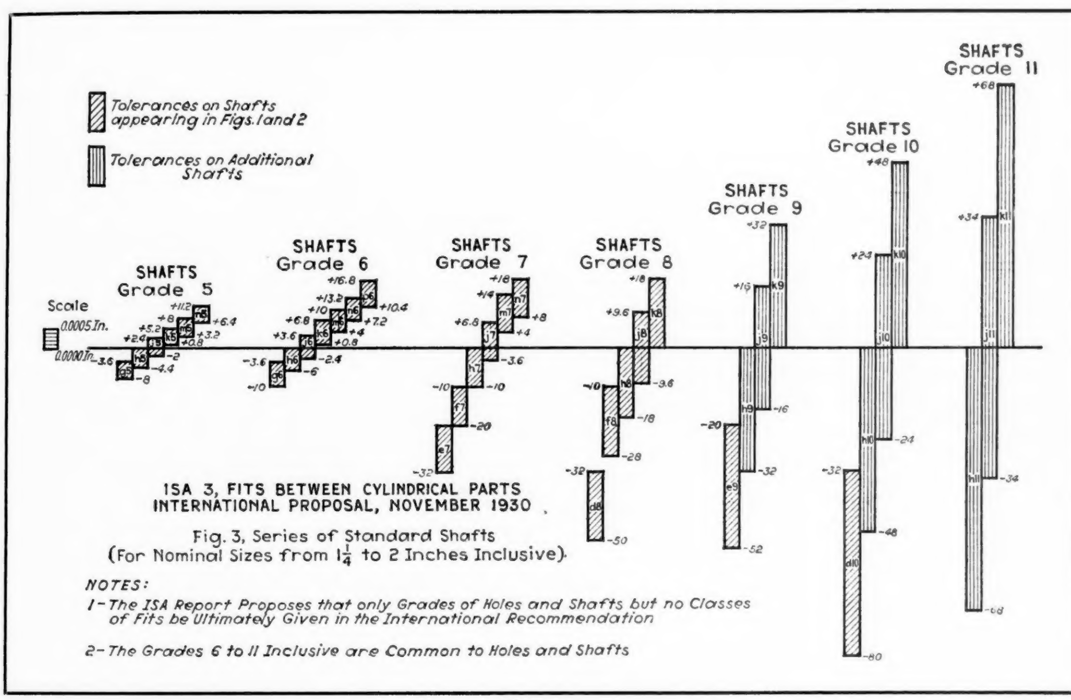


FIG. 3

Series of Standard Shafts

whether Grade III fits should or should not comprise transition fits. Transition fits are fits which may have a clearance or an interference depending on whether a hole that is on the large side happens to be mated with a shaft that is on the small side, or conversely. The French, German, and Swiss delegates were of the opinion that transition fits should not have tolerances larger than those of Grade II fits. Else the chance of obtaining a fit of the desired character would be too small, in their opinion. The Czech delegates, on the other hand, held that transition fits could suitably be established not only in Grade II, but also in Grade III.

Grade of fit	I	II	III	IV
Hole of tolerance (H)	6	10	18	18
Shaft tolerance (S)	4.4	6	10	18
Total tolerance (T)	10.4	16	28	36
Ratio between each value T, and the value T of Grade II	0.65	1	1.75	2.25

TABLE 1

Tolerances on Parts with a Nominal Size from 1¹/₄ to 2 Inches for Different Grades of Fits (Values in Ten-Thousandths of an Inch)

It was finally decided that Grade III would include transition fits, but the ISA proposal emphasizes the fact that such fits naturally give a lower chance of "hitting the target" than those of Grade II. The former are held to be suitable, however, for less exacting work and for shops that are not so well equipped as to be able to maintain the tolerances required for Grade II fits.

(*c*) *Relationship between grades of fits*—Table 1 shows the tolerances on basic holes and shafts used for the different grades of fits, for parts with a nominal size from 1¹/₄ to 2 inches, inclusive. It also shows the total tolerances, and the ratios between the latter. The total tolerance on parts giving Grade II fits—the most commonly used grade—has been adopted as the value 1 (see last line of Table 1), and the total tolerances of the three other grades have been expressed accordingly.

Grade of fit	I	II	III	IV	*Coarser work*
Hole	Very high grade reaming, grinding, or smooth tooth broaching	High grade reaming	Reaming	Reaming or boring	Drilling
Shaft	Very high grade grinding	Grinding	Very careful turning	Careful turning or precision drawing	Plain turning or drawing

TABLE 2

Machine Finishes for Different Grades of Fits

In connection with the above, it may be interesting to mention the machine finishes recommended by way of example in the International Standards Association proposal for the different grades of fits. These are listed in Table 2.

(*d*) *Ratio between hole and shaft tolerance*—The large majority of fits represented in Figures 1 and 2 occur between a hole and a shaft having different tolerances, the shaft tolerance being the larger one. Only in a few cases the tolerances on the mating parts are equal, such as those of the fits of Grade IV, Basic Hole System, Figure 1; and of one of the Grade IV fits, Basic Shaft System, Figure 2.

The larger tolerance on the hole is based on recognition of the fact that it is more difficult, in manufacturing practice, to keep a hole within a given tolerance than a shaft. In this connection the ISA proposal contains the following statement:

> "While nowadays shafts frequently are ground, the mating holes usually are still produced by reaming, an operation requiring a larger tolerance. However, it is sometimes held that even in cases where the holes are ground, a larger tolerance is required than for grinding shafts. This opinion is based on the fact that in producing holes, a deviation from the true cylindrical shape is more difficult to avoid."

In the Grade II fits—the most important group—the hole tolerance amounts on the average to somewhat over 60 per cent of the total tolerance on hole and shaft. To be exact, the percentage varies from 62 to 65, for the different subranges of diameters between about 0.04 inch and 7 inches. For the subrange from 1¹/₄ to 2 inches, represented in Figures 1 to 4, the percentage is 62.

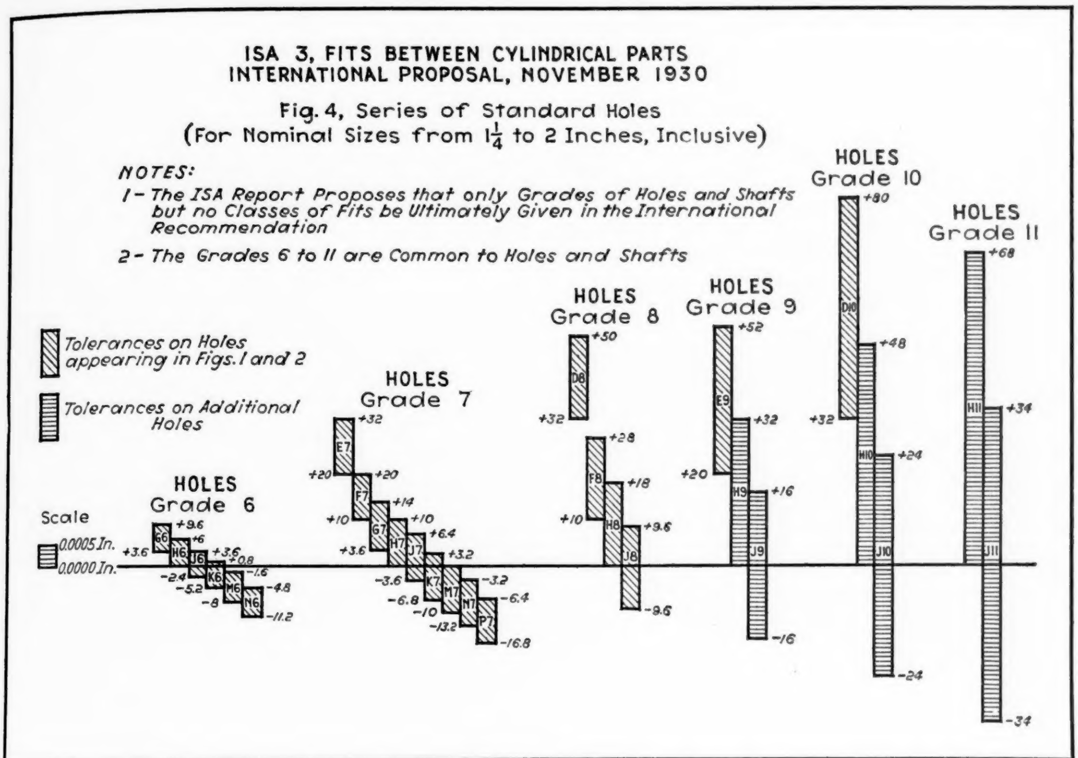


FIG. 4
Series of Standard Holes

Questions 8 and 9

Designation of fits by symbols—The ISA proposal recommends that the grades of holes and shafts—and therefore their tolerances—be designated by numerals, and the position of the tolerance relative to the reference line—and, therefore, the allowances—by a letter. Capitals are used for the holes and lower case letters for the shafts. The basic holes are thus designated by the symbols, H6, H7, etc., and the basic shafts by the symbols h5, h6, etc. For further symbols, see Figures 1 to 4, inclusive.

A fit between two mating parts is designated by the symbol for the hole followed by the symbol for the mating shaft. The two symbols may be hyphenated or separated by a slanting line, for example, H7-d8, or H7/d8.

Incidentally, standardization of the method of indicating fits on drawings will not be dealt with by ISA technical committee 3 on Fits, but by ISA technical committee 10 on Drawings.

Question 10

Working and inspection gages—The ISA proposal recommends that the values adopted for the manufacturing limits of the work be considered as the nominal sizes of the working gages; that is, of the gages used by the machine operator in the shop.

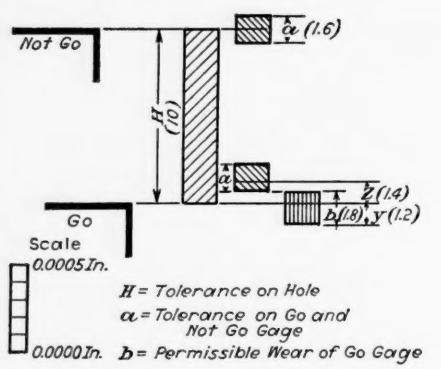
In order to explain the adoption of this seemingly obvious principle, it should be noted that some of the existing national systems make distinction between three kinds of gages: working gages, shop inspection gages, and purchaser's inspection gages. Different sets of limits are given for each kind of gages, in the systems concerned. The ISA subcommittee decided that the problem of inspection gages—both shop and purchaser's—would be dealt with later.

Question 11

Manufacturing limits and permissible wear of gages—In the ideal case, the actual sizes of the Go and the Not Go gages would exactly represent the limits of the work. However, the gages themselves being manufactured products, they inevitably vary more or less from their nominal sizes. For example, a Go plug gage for a hole with a low limit of 1.0000 inch may be found actually to measure 1.0001 inch. Also, gages are subject to wear through use—especially Go gages.

Besides specifying limits for the work, a standard on fits must therefore also lay down rules governing the permissible variation of

limit gages from their nominal sizes. This regards both the unavoidable inaccuracy in the



ISA 3, FITS BETWEEN CYLINDRICAL PARTS
INTERNATIONAL PROPOSAL
NOVEMBER 1930

Fig. 5, Position of Manufacturing Tolerances on Go and Not Go Working Gages and of Permissible Wear of Go Gage, Relative to Limits of Work (Hole)

NOTE: The Values in Parentheses are Given in Tenthousandths of an Inch and Apply to a Grade 7 Hole with a Nominal Size Lying within the Subrange from 1¼ to 2 Inches Inclusive

Fig. 5

Position of Manufacturing Tolerances on Go and Not Go Working Gages and of Permissible Wear of Go Gage, Relative to Limits of Work (Hole)

manufacture of the gages, and their change in size through wear.

In principle, two different standpoints may be taken with regard to this question. One standpoint is a very strict one. Its advocates, holding that the limits of the work are set with the definite purpose of keeping the work absolutely within these limits, object to any variation in gage size—whatever its cause may be—that would result in the acceptance of work that is outside its own limits or, conversely, in the rejection of work that is duly within its own limits. According to this view, all variations of a gage from its nominal size must, therefore, lie within the tolerance on the work.

The other, more liberal standpoint is that the actual size of a limit gage is permitted occasionally to lie slightly outside the tolerance on the work. For example, considering again the above example of the Go plus gage for a hole with a low limit of 1.0000 inch, it would be permissible for such gage to have a size of 0.9999 inch as a result of wear. The gage would then accept holes smaller than 1.0000 inch and although such holes are, strictly speaking, too small, those advocating the more liberal standpoint referred to hold that no great harm can be done by the acceptance of such holes. This viewpoint is based on the ground that the holes in question are likely to cause trouble only when assembled to shafts which are also somewhat outside their own limits, but on the large side. Three conditions would then have to be fulfilled actually to produce an incorrect fit of this type, as follows:

1. A slightly undersize hole must have been accepted by a Go plug gage worn past the low limit of the hole
2. A slightly oversize shaft must have been accepted by a Go snap gage worn past the high limit of the shaft, and
3. The undersize hole must happen to be mated with the oversize shaft, instead of other combinations occurring where the slight deviation of hole or shaft is of no consequence

In practice, the chance that such coincidence will occur is so small—so the advocates of the standpoint in question reason—that it may well be neglected.

The former of the two standpoints discussed above—the "strict" standpoint—was represented in the ISA subcommittee by the French delegates. It has also been adopted in the American Tentative Standard B4a-1925, which says on page 3:

"The extreme sizes for all plain limit gages shall not exceed the extreme limits of the part to be gaged. All variations, whatever their cause or purpose, shall bring these gages within these extreme limits."

The more liberal standpoint—permitting a gage occasionally to have a size slightly outside the limits of the work—has been adopted in the national standard systems of Czechoslovakia, Germany, Sweden, and Switzerland. Here, the Not Go gages have a (symmetrical) bilateral tolerance on the Not Go limit of the work, and the sum of the tolerance on the Go gage and its permissible wear is distributed on both sides of the Go limit. For example, a German Go plug gage is made with a plus tolerance and may wear past the Go limit an amount equal (or about equal) to this tolerance.

The two standpoints have been thoroughly discussed in the ISA subcommittee and it was agreed in principle that the tendency should always be to avoid trespassing of the limits of the work. On the other hand, it was realized that the present status of the art of manufacturing gages and also the considerable investment in existing stocks of gages—made in accordance

with the more liberal standpoint of the Continental systems—made it impossible rigidly to prohibit the trespassing of the limits of the work under all conditions.

The ISA subcommittee, therefore, made a recommendation in this respect which is a compromise between the two standpoints discussed above. According to this recommendation, illustrated by the diagram in Figure 5 applying to a Go and a Not Go plug gage taken as an example,

> the tolerance (*a*) on the Go gage is distributed equally on both sides of a line located within the tolerance on the work at a distance (*z*) from the Go limit. This line represents the size of the Go gage at which the gage manufacturer will aim;
>
> the permissible wear (*b*) of the Go gage extends from the minimum metal limit of the gage a distance (*y*) past the Go limit of the work;
>
> the tolerance (*a*) on the Not Go gage is distributed equally on both sides of the Not Go limit of the work, this being the size at which the gage manufacturer will aim in making the Not Go gage.

The values (*a*), (*z*), and (*b*) are laid down in the ISA proposal. They have been adopted with the idea in mind that, in principle, trespassing of the work limits by the gage size should be avoided, but that it is not feasible at the present time absolutely to prohibit such trespassing on account of existing practice laid down in national standards. The numerical values given in Figure 5 are those applying to plug gages used for checking a Grade 7 hole with a nominal size lying within the subrange from 1¼ to 2 inches (30 to 50 millimeters).

It is evident that if the ISA proposal discussed here becomes adopted by a number of countries as a basis for their national standard system of fits, each country will have the facility, but not the obligation, to permit Go gages to wear a distance (*y*) past the Go limit of the work. In other words, a country opposed to letting the Go gage wear past the Go limit of the work could adopt the value *zero* for the distance (*y*), whereas a country which permits such "extra" wear could adopt a positive value for (*y*). For example, the present American Tentative Standard B4a-1925 is based in principle on the value $y = 0$. No values for (*a*), (*z*), and (*b*) have as yet been laid down in an American national standard.

The increasing accuracy of gage manufacture and the increasing resistance of gage materials against wear will tend to bring the two standpoints referred to above—the "strict" and the "liberal"—closer together. In fact, increasing accuracy of manufacture means a smaller value (*a*), and a decreasing rate of wear practically means that the distance (*z*) can be reduced and that the extra amount of wear (*y*) becomes less necessary because a more resistive gage will have a longer useful life, even though its extreme limits are narrowed.

With a view to further progress in the art of gage making, the ISA proposal recommends that the specifications for tolerances on, and permissible wear of, gages be given renewed consideration in the future, but not earlier than ten years from now.

The ISA proposal specifies the grade of gage to be used for each grade of work, hole or shaft. By way of example, Table 3 shows the relationship between the grade of a hole (nominal size between 1¼ and 2 inches) and the grade of the gages required for checking such hole. Table 3 contains the finer Grades 2, 3, and 4, which are reserved for gages and perhaps for future extra fine work. The Grade 6 appears in Table 3 as the tolerance on the finest hole, and as the tolerance on the plug gage for the coarsest hole (Grade 11). Numerical values of the other dimensions are also given for the several grades of holes to visualize how the system works out in practice.

Hole (from 1¼ to 2 inches, incl.)	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11
Plug Gage (Go or Not Go)	Grade 2	Grade 3	Grade 4	Grade 5	Grade 5	Grade 6
Tolerance H on Hole	6	10	18	32	48	68
Tolerance (*a*) on Plug Gage	1.2	1.6	2.8	4.4	4.4	6
Permissible wear (*b*) of Go Plug Gage	1.2	1.8	3.0	4.2	4.2	5.8
Distance (*z*)	1.0	1.4	2.4	4.4	4.4	8.8

TABLE 3

Relationship between Grades of Holes and Grades of Corresponding Plug Gages (Dimensions in Ten-Thousandths of an Inch)

For snap gages the numerical values are the same as those for plug gages of corresponding size and grade, only the position of the tolerance and of the permissible wear relative to the Go limit of the work is of course the opposite of that applying to plug gages.

Note

Inch and metric units—In the ISA proposal the numerical values of tolerances and allowances are given in microns exclusively. One micron equals 0.001 millimeter or with very close approximation 0.00004 inch. The latter conversion value is adopted in the above report and the micron values given in the ISA proposal are converted to values in ten-thousandths of an inch. One reason for doing so is that the "tenth" is the smallest subunit of the inch commonly used at the present time in American workshop practice for specifying fits between holes and shafts. (For gage work smaller subunits are used, such as hundred-thousandths of an inch.) Another reason is that the ratio, "one-tenth" equals 2.5 microns, is close enough in the large majority of cases where tolerances on work and allowances are concerned to secure practical interchangeability between fits established in the inch, and in the metric system.

It is realized, however, that in case the American and the Continental groups should come to an agreement in principle on an international system of fits the question as to whether a closer approximation to the exact conversion ratio between the "tenth" and the micron is required should be given further study. The exact ratio, one "tenth" equals 2.540005 microns, is based on the relationship between the inch and the millimeter as officially adopted by the Bureau of Standards; that is, one inch equals 25.40005 millimeters.

Questionnaire

In order to get a preliminary expression of opinion from sectional committee B4 with regard to the main features of the ISA proposal of November, 1930, discussed in the present report, the following questions have been laid before the members of committee B4 on behalf of the ISA subcommittee. ASA will transmit the conclusions at which the sectional committee arrives to ISA technical committee 3 on Fits.

The questions to be answered are:

1. Do you agree with the proposal that the reference temperature for limit gages, etc., be 68 degrees Fahrenheit (20 degrees Centigrade)?

2. (a) Do you agree with the proposal that for the time being nominal diameters up to 180 mm (about 7 inches) be dealt with, this range to be extended later to 500 or 600 mm (about 20 to 24 inches)?

(b) Which of the two upper limits of the extended range of diameters would you prefer, 20 or 24 inches?

3. Do you agree with the proposed subdivision of the range of diameters up to 180 mm (about 7 inches) into subranges, for each of which tolerance and allowance values are kept constant?

4. Do you agree with the principle that the numerical values of tolerances and allowances are determined on the basis of practical data, abandoning for the present time any effort to establish a mathematical law governing these values?

5. Do you agree with the proposal that the Basic Hole and the Basic Shaft System be adopted side by side as standard systems?

6. Do you agree in principle with the proposal that unilateral tolerances be adopted?

7. (a) Do you agree with the proposal that the designation "grade" instead of applying to a complete fit—that is, to the combination of a hole and a shaft—shall apply to the individual holes and shafts?

(b) Are you in favor of establishing standard sheets giving series of fits (for example, hole H-7 combined with the shafts p-6 to g-6, f-7, e-7, and d-8) similar to those given on the standard sheets so far adopted in Europe? (See Figures 1 and 2.)

8. (a) Do you agree with the proposal that the grade of a hole or shaft be designated by a numeral?

(b) Do you agree with the proposal that the numeral 5 be assigned to shafts of the finest grade, the numerals below 5 being reserved for manufacturing tolerances on limit gages and for closer tolerances on work that may become necessary in the future?

(c) Do you agree with the proposal that letter symbols be used for the designation of the individual tolerances, capitals to be used for hole tolerances and lower case letters for shaft tolerances?

9. Do you agree with the proposal that in cases where both the symbol for a hole and n symbol for the mating shaft are used—for example, for indicating a fit on a drawing—the symbol for the hole be mentioned first?

10. (a) Do you agree with the proposal that in principle the limits of the work shall be represented by the nominal sizes of the working gages?

(b) Should inspection gages also be given consideration in the proposed ISA system, in addition to working gages?

11. Do you agree with the proposal concerning the position of the manufacturing tolerances and the permissible wear of working gages, relative to the nominal limits of the work?

12. Do you wish to make any suggestions for changes or additions?

Technical Standards for Consumer Goods—A "Five-Year Plan"?[1]

by

P. G. Agnew, *Secretary*
American Standards Association

A proposal for the development of standards and specifications based upon research and followed by widespread education of consumers

The committee in charge of this meeting has asked me to outline some concrete suggestions as to things which the association and its members can most easily do in advancing toward one of your most important objectives: viz., to make readily available to ultimate consumers in their purchases the great economies which the use of standards has made available to corporations, and to city, state, and federal governments in their purchases.

We in the American Standards Association are asked from time to time for similar suggestions in the standardization work of trade associations and engineering groups. But your problem is different and more difficult, because the ultimate consumer is so numerous and unorganized; because of the role played by the retailer; and because of the age-old customs and habits of people in buying and selling.

The possibilities of your objective, if it can be attained, are fascinating. It would constitute a major advance in our national economy. At the present rate of technological and administrative advance our production per man-hour will double within two or three decades. This means an increase of production great enough to raise the standard of living of the whole population to the present level of the middle classes.

This is provided the gain in productive power is not dissipated through increasing costs in distribution, or otherwise.

The ratio of the cost of selling goods to the cost of making them has been steadily increasing for many years. In most lines the retail link of the distribution chain absorbs at least 40 cents of the consumer's dollar.

In contrast, many corporations are, through standardization technique, making their purchasing comparable in efficiency with their production methods.

The difficulties to be overcome are great—perhaps greater than any of us realize. I have upon occasion made the statement that to realize the objectives of your association will involve an expenditure of human effort much greater than was expended in digging the Panama Canal. To my mind, the possibilities are so great, however, that such an expenditure would be justified many times over should your hopes appear to have a reasonable chance of success.

Now is a particularly opportune time to plan your work and to start actively on it.

Definite Plan Necessary

May I state in categorical form the fundamental features of your problem as I see them?

First, you must have a plan. An objective is not enough. Your plan should be comprehensive; it should be outlined with the greatest care; and it should be projected to guide your activities for a considerable period of time (though it will, of course, have to be modified from year to year). You might well organize it as your own "Five-Year Plan." It should be set down in clear, simple language so that every member of the association may easily and clearly understand it. Each member should have a copy of it.

Second, your plan should set forth clearly the functions which it requires shall be fulfilled, respectively, by your officers, by your committees, by your classroom teachers, by your college and city supervisors, and by those of your members who are equipped to carry out technical and scientific research on the many problems which your plan must encompass.

Third, success or failure will depend very largely upon the degree of technical competence which it is going to be possible to develop in the membership of the association, and upon the administrative skill with which the efforts of your members are coordinated and are brought to bear upon the commercial processes of the marketing of goods.

Fourth, your problem is, in large measure, a

[1] An address delivered at the Annual Meeting of the American Home Economics Association, Detroit, Michigan, June 22–26, 1931.

community one. In so far as you are going to be able to make yourselves an active force in the practical world of buying and selling, this will necessarily have to come about through each of you, in connection with your own job, making yourself an informed and forceful leader in your community in carrying out your own individual part of your plan. Each of you will have to interpret the plan in terms of local needs, and help adopt it as a working tool for your students, for the homes from which they come and to which they will go, and also for clubs, extension organizations, and other local consumer groups. To do this successfully will require that you act as cooperative contacts for consumers with the stores which serve your communities. This must be a necessary part of the "plan" if you are to play a significant role in helping the average store actually to become, to a measurable degree, purchasing agents for the community instead of mere outlets for the manufacturer.

Experience with Specifications

Turning from these more general principles, let us look to the experiences which your own association and other groups have accumulated as the result of efforts during the last three or four years toward the development of specifications for consumers' goods and toward bringing it about that the information concerning commodities which is essential to intelligent buying be made regularly available to consumers—and in more or less standardized form.

In the last three or four years we have seen a steadily growing interest in this whole subject, not only on the part of home economists but also on the part of many other groups. For example, your association has received so many requests for help in arranging programs for discussion on the subject in club meetings that in cooperation with the Bureau of Home Economics it has issued a brochure on the subject. Several manufacturing groups have shown a definite interest in it, as have some of the department stores and mail-order houses.

Four projects involving the development of national specifications have been organized under the procedure of the American Standards Association. These deal with sheets, bed blankets, refrigerators, and gas utilization apparatus. The first three of these were initiated by your association.

The first two of the projects mentioned have encountered serious difficulties. Of these I should like to discuss with you the project of specifications for sheets, as it very clearly illustrates the nature of the fundamental difficulty which you are bound to meet over and over again and which, to my mind, makes it necessary that your association should have a most thoroughly worked-out plan for carrying out your standardization activities and to which I referred a few minutes ago as your "Five-Year Plan." The project of sheets was determined upon at a formal conference at which the manufacturers, distributors, home economists, institutional buyers, and other groups agreed to undertake the development of national specifications for sheets. The representative technical committee which was organized for the work had the advantage of access to the results of a very considerable amount of research work on the properties of sheets which had been carried out by home economists, by the federal government, and by other agencies.

When the technical work began to assume definite form the manufacturers reconsidered their position. Through their trade association, which was speaking for them in the matter, they indicated an unwillingness to proceed either with the setting up of definite specifications or with making available, through uniformly arranged "tickets," data which the consumer representatives consider an essential minimum, such as thread count, strength, weight, and amount of filler or loading. On the other hand, they have indicated that they are not yet prepared to assume responsibility before the public for breaking up the project and have suggested that the whole question be re-examined to see whether some mutually satisfactory solution cannot be found.

The manufacturers have made it clear that they are greatly concerned in regard to the effect that the project for nationally recognized specifications for sheets might have upon their trade brands, in the building up of which they have spent great sums in advertising. They state that the consumers are not now making a significant number of requests for either the specifications or the data which the technical committee proposed should be regularly supplied with sheets, and that at present the only real demand for such information comes from the larger distributors who want it for their own use rather than to pass on to the consumer. Furthermore, they say they see very little prospect of adequate consumer support in such a proposed movement.

It is plain that this attitude on the part of the sheets and sheeting manufacturers constitutes an invitation, not to say a challenge, to your association to become an effective factor in the whole problem. This you can do only through a planned and coordinated program. It seems to me that the manufacturers are justified by economic self-interest in asking for reasonable assurance of real consumer support if they are to become a party to such important experiments in marketing methods as are being urged by your association.

The case clearly shows that the methods which your association has been using up to this time are inadequate to accomplish your purpose. This is true even when, as in this case, you have able and experienced research workers, who bring to the project adequate test and service data which are as good as, or better than, any which have been developed by the manufacturers.

Organizing Consumer Support

A further step which is necessary is to organize consumer action and bring it to bear upon the stores in your local communities, in order to give the necessary consumer support to those manufacturers and distributors who are willing to cooperate in your program. One approach to this end I should like to commend to you for serious study and trial. This is that your association prepare a leaflet setting down just as clearly as possible the three, or four, or five characteristics of sheets which determine their quality and durability, with simple, clear directions as to what data a consumer should ask for in buying sheets. It is not now available to her on the "ticket" and is seldom obtainable from the sales person. So good a job should be done in the preparation of this leaflet that it should be directly usable by, and should appeal to, a large number of people, including:

The classroom instructor

The supervisor, in outlining courses

The housewife, in buying sheets

The sales person, in giving information to customers in guiding their purchases

The store buyer and department manager in training the sales force

Women's clubs and consumer groups

The manufacturers in the preparation of advertising copy

The distribution and use, as well as the text, of such a leaflet should be most carefully planned (the text with the cooperation of the manufacturers and the National Retail Dry Goods Association). Just prior to extensive use in the schools or in the local clubs, the home economics supervisors in such schools might well go to the managers of the white goods departments in the principal stores, explain the use that is going to be made of it, and ask that the sales force be so instructed that they will be in a position to furnish the necessary information and guidance to consumers when they ask for the information outlined.

I should think that such a leaflet could be used in many other subjects; for example, silks, with which your association is already engaged; gas burning appliances; and certain foods, such as eggs, butter, and meat, upon which a large amount of standardization work has already been accomplished by the U. S. Bureau of Agricultural Economics. The method should also be applicable to many other subjects.

I am going to take as another illustration a kitchen utensil—the lowly can opener. This device has been the object of many jokes as illustrating a subject too unimportant to deserve serious consideration. I have pondered the subject long enough to see that this is not the case, however. The can opener, while not yet to be classed as big business, is of very respectable economic stature. If each family in this country were forthwith provided with a can opener which is capable of opening cans, it would represent an investment at present retail prices of at least twenty million dollars. If we add to the sum actually spent annually for can openers the waste through accidents occuring in trying to open cans, lost time, and the cost of treating cut fingers, we shall get a sum running into the millions annually, to say nothing of the social cost of domestic infelicities and impaired dispositions.

Becoming interested in the subject some time ago, at the instance of my wife, I found, first, that most "can openers" are not so designed as to open cans successfully; and, second, that rather recently there have come on the market a few types of the device that are designed to, and actually do, open cans. Having selected one of these which seemed to be particularly effective, I purchased it and triumphantly presented it to my wife. She immediately discovered, however, that while it very successfully opens cans, it has the rather disconcerting habit of depositing an appreciable amount of fine metallic dust in the food during the process of opening. Nothing daunted, I laid the problem before a consumers' research organization. They have made a preliminary investigation in the matter, in which they secured the cooperation of experienced engineers, and report the sad fact that as yet all can openers can be classed in two groups: first, those that are not designed to open cans effectively; second, those which are designed to, and actually do open cans, but in doing so, deposit a small amount of metallic dust in the contents of the can.

The Utilization Point of View

Compare the can opener with the turbo-generator. The manufacturers do not bring out a great variety of hundred thousand horse-power turbo-generators and then attempt to sell them by highly elaborate technique, such as sales quotas, to break down the "sales resistance" of the power companies. Instead, the turbo-generators are designed through the most intimate cooperation between the user and the manufacturer. Throughout, the utilization

point of view dominates. Precisely the same process goes on in the manufacture and sale of telephone switchboards, and with thousands of other types of equipment purchased by corporations.

If the same methods were followed with can openers, the needs and desires of consumers in regard to this utensil would be found out through broad and intimate contact between the groups concerned. The necessary research, even though it should prove to be extremely difficult and costly, would be carried out to determine what technical requirements would assure the desired results. These requirements would then be modified into definite specifications. It would enable the consumer, if she bought can openers which complied with the specifications, to have a device which would open cans and at the same time would not contaminate the food contents with metal particles. The organized consumer groups would cooperate with manufacturers and distributors in making this fact thoroughly known to consumers generally.

This, I take it, fairly epitomizes the main objective of your standardization program.

Incidentally, turbo-generators and telephone switchboards went through the same trial-and-error methods of marketing that now control can openers, but through the application of organized technology they have steadily evolved to their present state.

How a Plan Would Work

This can opener problem is typical of hundreds of problems that you might be solving successfully if you had a well-worked-out "Five-Year Plan" in effective operation. Serious research work on can openers is not beneath the dignity of the home economist or anybody else. This is true of all of the materials and utensils which enter into our everyday life. Perhaps this homely illustration will clarify what I have been trying to say in generalized form. A thoroughly organized plan which was understood by your entire membership, and in which your officers, committees, classroom teachers, supervisors, and researchers were all carrying out assigned functions, would be dealing effectively with a large number of such problems in almost routine fashion. For example:

1. Requests for work on can openers and similar problems would be brought systematically to the attention of the association and its committees by:

Classroom teachers

Clubs and other consumer groups

Manufacturers and merchants (who unquestionably would seek your assistance just as soon as your association became effective in finding out and crystallizing consumer needs and wishes)

Agricultural extension agencies (which, with your own association, occupy a key position in this whole subject). The problems thus suggested would be referred to a research or standards committee.

2. Your committees would have available a list of your research workers and problems upon which they would be engaged. (Incidentally, it would be an important function of the research committee to develop a much larger number of active investigators, and to develop the undertaking of cooperative research work between larger laboratories, such as the Bureau of Home Economics, Bureau of Standards, and numerous association and institutional laboratories.) These committees would see that such problems as our can opener illustration were tackled in a systematic way by two or three competent investigators. This would include both comparative tests on regular commercial can openers, and experiments to determine the characteristics which are desirable in can openers.

3. The results would be presented not only to the association membership, through publications in your state and national journals and discussions at your technical sessions, but also, under the guidance of your committees, these results would be brought to the attention of consumers generally, through the classrooms, clubs, and agricultural extension agencies, and to merchants, both through general organizations and through local contacts, in some such way as I have already outlined.

4. Such planned preparatory work would put the association in an excellent position to bring about national specifications for can openers, and for hundreds of other things, and to handle their part in such undertakings effectively. A long list of such subjects readily comes to mind, such as soap powders, preserving-jar rings, twine, paring knives, and shears, egg-beaters, scouring powders, and vacuum cleaners. The textile field alone presents a large number of such problems, not the least of which would be bringing about nationally recognized definitions of such terms as "sunfast," "tubfast," "pre-shrunk," etc.

Speaking from the standpoint of an outside but sympathetic observer, I will sum up by saying that the greatest need of your association, if you are to realize the extremely far-reaching objectives of your standardization program, is a thoroughly thought-out plan, which should be reduced to documentary form. If you are to provide effective representation of the consumer, the plan will have to include means of collecting and crystallizing consumer opinion in your own communities, and of bringing the weight of this opinion to bear wherever it is needed.

ASA PROJECTS

Results of Six Years' Work of the Sectional Committee on Wood Poles

by

R. L. Jones,[1] *Chairman*
Sectional Committee on Wood Poles

With their approval by the American Standards Association on June 20, the specifications for northern white cedar, western red cedar, chestnut, and southern pine poles that have been prepared by the sectional committee on wood poles (O5) became American Tentative Standards.[2] For six years the sectional committee has been engaged in coordinating a large amount of diversified and somewhat contradictory data, and developing the new standards on a sound engineering basis. Ten classes of poles are defined by standard dimensions. The range of sizes provided should enable the engineer to make an economical selection to meet his specific requirements.

The preparation of the standards has been made possible largely by the coordinated efforts of the members of the various subcommittees. Of basic importance was the work of the subcommittee on fiber strength under the chairmanship of H. C. Dean of the New York and Queens Electric Light and Power Company. Existing data on the fiber strength of the four species of wood considered—northern white cedar, western red cedar, chestnut, and creosoted southern yellow pine—derived from tests on full-size poles and on small clear specimens were analyzed to arrive at average values and estimates of probable variation. As a result of this work, figures for ultimate fiber stresses for the four species were approved as American Standards in November of last year. A notice of their approval appeared in the ASA Bulletin for December, 1930.

Knot Limitations Studied

Another important study was undertaken by a special subcommittee on knot limitations under the chairmanship of R. H. Colley of the Bell Telephone Laboratories, vice-chairman of the sectional committee. A large amount of data had to be gathered on the number and size of knots in poles of the four species of wood under investigation. Graphs showing the numerical distribution of knots of various sizes in representative lots of poles were prepared and from these curves were drawn up tables of knot limitations that constitute parts of the respective specifications.

To the subcommittee on pole dimension tables, headed by J. S. Ware of the Public Service Electric and Gas Company, is due credit for the new standard dimensions. Because the circumference dimensions at six feet from the butt are based on the standard ultimate fiber stresses, poles of the same class of all four species are rated as having equal initial strengths. Minimum circumferences are specified for the tops. The tables, together with the basis for the classification, were published in the Bulletin for last December.

The results of the work of these three subcommittees considerably simplified the tasks of the four species subcommittees. The subcommittee on northern white cedar was headed by C. H. Amadon of the Bell Telephone Laboratories, the subcommittee on western red cedar by C. E. Mobius of the Western Union Telegraph Company, the subcommittee on chestnut by Rufus Gould of the Postal Telegraph Company, and the subcommittee on southern pine by J. N. Kirk of the American Telephone and Telegraph Company. Subcommittees on Douglas fir and on lodgepole pine are now being organized, with H. Michener of the Southern California Edison Company and R. W. Lindsay of the Mountain States Telephone and Telegraph Company, respectively, as chairmen.

The approval of the new standards, the first American Standards for wood poles, marks an important step toward simplified practice in an essential public utility commodity. Their application, as is true of other well conceived standards, should yield many engineering and economic advantages.

Copies of the new standards may be obtained from the American Standards Association Information Service. They have been published as four pamphlets, each pamphlet dealing with one species of wood.

[1] Director of Apparatus Development, Bell Telephone Laboratories, Incorporated, New York City.

[2] Notice of approval of the new standards appears on page 21 of this issue of the Bulletin.

ASA Approves Personnel for Foundry Safety Code

The personnel of the committee preparing the revision of the Safety Code for the Protection of Industrial Workers in Foundries (B8-1922) was approved by the ASA Standards Council at its meeting on June 8, 1931. This code is being prepared under the sponsorship of the American Foundrymen's Association and the National Founders Association. The cooperating bodies, in addition to the sponsors, which have appointed representatives on the committee, are: American Society of Mechanical Engineers; American Society of Safety Engineers—Engineering Section, National Safety Council; Association of Governmental Officials in Industry; Cast Iron Pipe Research Association; National Association of Manufacturers; National Association of Mutual Casualty Companies; National Bureau of Casualty & Surety Underwriters; National Founders Association; National Safety Council; National Safety Council Equipment Manufacturers Section; Pennsylvania Department of Labor & Industry; Steel Founders Society of America; U. S. Bureau of Standards; U. S. Department of Labor; U. S. Bureau of Public Health Service.

W. C. Wright, a foundry consultant, is serving as a member-at-large.

The original code for this project was approved in 1922 as American Tentative Standard. The present revision is intended to bring the code up-to-date and advance it to American Standard. The temporary committee, while waiting for approval, has been at work on the revision and the work is far enough advanced that the final draft will be completed within the next two months.

Board Expresses Gratitude for Services of W. J. Serrill

The American Standards Association, through a resolution adopted by the ASA Board of Directors, has expressed its deep appreciation of the work of William J. Serrill, past president, on behalf of the Association. Mr. Serrill, in addition to his three-year term as president, has represented the American Gas Association on the ASA Standards Council for several years. Mr. Serrill directed the reorganization of the old American Engineering Standards Committee, which became the American Standards Association in October, 1928. The resolution adopted by the ASA Board of Directors follows:

Resolved, that the Board of Directors express to William J. Serrill, last chairman of the American Engineering Standards Committee, and first president of the American Standards Association, grateful appreciation of the great services he has rendered the organization, both as president and as chairman of the Board of Directors, giving generously of his time and effort, and guiding the reorganization and subsequent affairs of the Association and the Board with such good judgment and unfailing tact as to lay a firm foundation for the future development of the Association and its work.

Brakes and Brake Testing Committee Reorganized

The sectional committee of the Safety Code for Brakes and Brake Testing (D4-1927) has been completely reorganized by the sponsors, the American Automobile Association and the United States Bureau of Standards. The new personnel, which was approved by Standards Council on June 8, 1931, includes representatives of the following organizations: American Automobile Association; American Association of State Highway Officials; American Electric Railway Association; American Society of Civil Engineers; Asbestos Brake-Lining Association; Automotive Council of Los Angeles; Bendix-Cowdry Brake Tester, Inc.; Eastern Conference of Motor Vehicle Administrators; Enos Safety Foundation; Ford Motor Company; Highway Research Board; International Association of Police Chiefs; Iowa State College; Motor and Equipment Association; Motor Vehicle Conference Committee; National Association of Mutual Casualty Companies; National Association of Taxicab Owners; National Automobile Chamber of Commerce; National Automobile Dealers Association; National Bureau of Casualty & Surety Underwriters; National Electric Light Association; National Highway Traffic Association; National Research Council; National Safety Council; Society of Automotive Engineers; State of Oregon; State of Minnesota; Underwriters Laboratories; U. S. Bureau of Standards; U. S. Bureau of Public Roads; U. S. War Department; Weaver Manufacturing Company.

The original code, approved in 1927, covered only two-wheel braking systems for passenger cars. The revision is intended to include all types of braking systems now in use on both passenger cars and trucks. As soon as sufficient funds have been provided to carry on the research work contemplated by the committee, active preparation of the revised draft will be undertaken.

Subject of Patents before ASA Standards Council

Suggestions will be welcomed from Sustaining-Members regarding the policy that should be followed by the American Standards Association in considering standards involving patented products, methods of work, or safety methods. A memorandum on this subject has been circulated to members of the Standards Council and the matter will be discussed at a future meeting of the Council. The memorandum says in part:

> "Cases may arise in which the ASA will have to consider the approval as an American Standard of a standard involving patented products, methods of work, or safety methods. This will raise the following questions of principle:
>
> "1. It may be held that the examination of such a case by the ASA should be restricted to finding out whether the standard has been set up in accordance with regular ASA procedure, and that no consideration should be given to the question as to whether or not the object of the standard is patented.
>
> "2. It may be held that the property rights inherent to a patent require careful consideration by the ASA of any case where a patented object is submitted for approval as an American Standard. In fact, the ASA, by giving its approval to a standard, endorses it for the widest possible use by industry. If such use is dependent on the granting of patent rights, such as a license, the approval of the standard by the ASA lends support also to the patent. Thus the question arises whether the fact that ASA approval tends to increase the use of the standard, and also the fact that a restriction is placed on its use by the patent, do not create a controversial situation with which the ASA as a judicial body should not try to deal.
>
> "3. In cases in which patentees are willing to grant the use of the patent free or against payment of a nominal fee, the patent may become an actual means of promoting the use of the standard.
>
> "4. A further consideration arises in the relation of a patent to a safety code, since if a code is adopted by a state commission compliance with the code may thereby become legally compulsory."

A copy of the memorandum, which also includes notes concerning the policy followed by different organizations, will be sent to Sustaining-Members on request. Any comments should be addressed to P. G. Agnew, secretary, American Standards Association, 29 West 39th Street, New York, N. Y.

Standards for Wood Poles Approved by ASA

The following American Standards for wood poles were approved by ASA on June 20:

- Dimensions of Northern White Cedar Poles (O5b2-1931)
- Dimensions of Western Red Cedar Poles (O5c2-1931)
- Dimensions of Chestnut Poles (O5d2-1931)
- Dimensions of Southern Pine Poles (O5e2-1931)

On the same date the following specifications were approved by the American Standards Association as American Tentative Standards:

- Specifications for Northern White Cedar Poles (O5b1-1931)
- Specifications for Western Red Cedar Poles (O5c1-1931)
- Specifications for Chestnut Poles (O5d1-1931)
- Specifications for Southern Pine Poles (O5e1-1931)

The sponsor for the project under ASA procedure is the ASA Telephone Group, which includes the Bell Telephone System and the United States Independent Telephone Association. Besides the standards just approved, the Sectional Committee on Specifications for Wood Poles (O5), under the sponsorship of these two organizations, was responsible for the development of the ultimate fiber stresses for wood poles (O5a-1930), which were approved as American Standard by the American Standards Association in December, 1930.

R. L. Jones, Bell Telephone Laboratory, New York City, is chairman of the Sectional Committee on Specifications for Wood Poles, and A. B. Campbell, National Electric Light Association, New York City, is secretary. The work involved in the preparation of the standards is described by Mr. Jones on page 19 of this issue.

The dimensions and specifications have been published as four pamphlets, each pamphlet containing the dimensions and specifications for one species of wood. Copies of the pamphlets are available at 20 cents each from the American Standards Association. A schedule of discounts for quantity orders has been fixed and will be sent to any one interested in securing a large number of these standards.

A Progress Report on the Work of the Committee on Electrical Definitions

The following table shows the status of the work of subcommittees of the Sectional Committee on Definitions of Electrical Terms (C42). The reports of the subcommittees are first circulated and approved by the individual subcommittees. Circulation is then extended to include the entire sectional committee under a ruling calling for comments and criticism within 60 days. Finally they are distributed in printed galley-proof form.

At the June 3, 1931, meeting of the executive committee of this sectional committee it was decided that in view of the ample opportunity for criticism of definitions which the procedure of the committee has permitted, and the fact that a very large percentage of the definitions have been taken from existing standards, the publication of the sectional committee's report should not be delayed by any last-minute comments or criticisms of individual definitions. If such criticisms prove so serious as to be incapable of adjustment, the definitions affected are to be dropped out of the final report, the terms only being printed with a suitable note indicating that they are under discussion. This will expedite completion of the first report, which it is expected will be ready for publication before the end of this year. After this complete report is available a letter ballot of the sectional committee will be taken and the report submitted to ASA for approval. A. E. Kennelly, Harvard University, Cambridge, Massachusetts, is chairman of the sectional committee. The sponsor for the project is the American Institute of Electrical Engineers.

Sectional Committee on Electrical Definitions
Status of Work of Subcommittees
June 5, 1931

Subcommittees and Names of Chairmen	*First Draft Sent to Committee Members under 60-Day Rule 1931*	*Revised Draft Sent to Committee Members under 60-Day Rule 1931*	*Number of Definitions in Report to Date Total—3046*
No. 1—General & Fundamental Terms (H. L. Curtis)			
Divisions of Report in Preparation			
1. General Terms	March 12		
2. Matter & Electricity	June 16		
3. Electrostatics	March 12		
4. Electrokinetics	June 2		
5. Magnetism	June 2		370
6. Elec. Properties of Matter	June 16		
7. Units & Systems of Measurements	June 2		
8. Physical Laws & Effects	May 29		
9. Apparatus & Accessories	June 16		
10. Miscellaneous			
11. General Engineering Terms	June 16		
No. 2-A—Electrical Machinery (C. V. Christie)			
First Report	March 12		
Second Report	April 7		149
Third Report	May 14		
No. 2-B—Transformers (R. C. Sogge)		May 11	73
No. 3-A—Switching Equipment (H. E. Ruggles)	January 16		158

No. 3-B—Control Equipment (H. D. James) First Report Second Report Third Report	January 2 April 22	March 25	101
No. 4—Instruments and Testing (J. F. Meyer)	May 20		148
No. 5—Generation, Transmission, and Distribution (C. H. Sanderson) Divisions of Report in Preparation 1. General 2. Systems 3. Components of Systems 4. Construction (Overhead) 5. Construction (Underground) 6. Wires & Cables 7. Miscellaneous 8. Generation	*May, 1930* January 16 March 26 May 23 May 23 May 23 May 23 June 16	January 2 May 11	370
No. 6—Transportation (J. H. Davis) First Report Second Report Third Report	January 2 June 16	May 11	409
No. 7—Electromechanical Definitions (E. B. Paxton) Elevators & Hoists	June 16		48
No. 8—Welding (F. M. Farmer)	July 1		150
No. 9—Illumination (C. H. Sharp)	January 2	June 23	76
No. 10—Electrochemistry & Electrometallurgy (G. W. Vinal)	April 7		184
No. 11—Wire Communication (W. H. Martin)	May 14		351
No. 12—Radio Communication (H. Pratt)	June 16		170
No. 13—Radiology (M. G. Lloyd)	May 14		60
No. 14—Electrobiology (M. G. Lloyd)	May 14		47
No. 15—Miscellaneous (M. G. Lloyd)	May 14		182

Portland Cement Standard Approved by ASA

A revision of the American Standard, Specifications for Portland Cement (A1-1928), one of a group of standards over which the American Society for Testing Materials exercises sole sponsorship under ASA procedure, was approved by ASA on June 17. The sectional committee which prepared the revision is an enlargement of the A.S.T.M. committee on cement—C1. Through the addition of members adequate representation of industry was obtained.

The standard, originally approved by ASA in 1921, was revised in 1928. In the 1921 and 1928 editions the standard included specifications for Portland Cement and also methods for testing cement. In the recent revision, however, the standard has been broken up into two parts in accordance with the action of the A.S.T.M., which was approved by the sectional committee. The revisions will carry the following designations and titles:

A1a-1931—Standard specifications for Portland cement

A1b-1931—Standard methods of testing Portland cement

The corresponding A.S.T.M. designations are C9-30 and C77-30.

As it has been customary practice for ASA and the A.S.T.M. to furnish the specifications and the methods of testing for Portland cement as one document, orders for specifications for Portland cement will be filled by mailing copies of both standards. Copies are available through the ASA Information Service.

Sectional Committee Conducts Tests on Pipe and Castings

Tests on cast-iron pipe and fittings have been made during the past several years in connection with the standardization work undertaken by the Sectional Committee on Specifications for Drain Pipe and Special Castings (A21). On the tests carried out at three universities during 1930, Mr. A. V. Ruggles, executive assistant to the chairman of the sectional committee, reports as follows:

"At the University of Illinois under the direction of Professor M. L. Enger, strength tests were made on 6 in. and 20 in. pit cast pipe and on 6 in. and 12 in. tees, crosses, quarter bends, and wyes. These tests have added valuable and needed knowledge on the strength properties of pipe and fittings and in the case of the latter are showing how slight changes in the dimensions at important points will contribute a material advantage in strength

"At Iowa State College under the direction of Mr. W. J. Schlick, drainage engineer, trench load tests were completed on 20 in. pit cast pipe. Some of these tests are made with no internal water pressure and others with internal water pressure running up to about 1400 lb per square inch. The reports on these tests offer a method of determining the allowable supporting strength of cast-iron pipe subjected to internal water pressure and present average strength ratios for determining the supporting strengths with different pipe-laying conditions.

"At Cornell University under the direction of Professor E. W. Schoder, tests were completed on friction loss through 6 in. and 12 in. eighth bends, quarter bends, tees, and crosses. These tests have been made with entry velocities varying from three to ten feet per second, and the fittings tested have been of two kinds, American Water Works Association standard fittings and others of shorter dimensions which the committee has under consideration. These tests are bringing out the effects on friction loss of the radius of curvature of the inside corners of tees and crosses as this inside radius is six inches in the case of American Water Works Association fittings and two and a half inches in the short fittings. Some other fittings have also been tested with one inch radius at these inside corners and still others with sharp intersections such as are found in fittings used for steam.

"Tests on organic coatings and linings were made at the shops of the American Cast Iron Pipe Company at Birmingham, Alabama, under the direction of S. R. Church, chairman of Subcommittee 3-B on Organic Coatings.

"Tests in service of cement-lined pipes were inaugurated at the works of the Birmingham Water Company, Birmingham, Alabama, by E. O. Sweet, superintendent of water of that company and chairman of Subcommittee 3-C on Inorganic Coatings and Linings.

"Subcommittee 3-C, E. O. Sweet, chairman, also adopted tentative specifications for cement linings for cast-iron pipe and forwarded them to technical Committee 3 on Corrosion and Coatings for its consideration.

"The comprehensive program of tests of various kinds being carried through by this sectional committee results in a great deal of new information on the properties of pipe and fittings, upon which revisions of existing specifications will be based, and all of which is now being carefully studied and analyzed by the three main technical committees and the 14 subcommittees handling the various topics, comprising a total membership of 100 men actively engaged on this work."

Correction in Standard for Fire Fighting Equipment

Attention is called to a typographical error in the published standard, Fire Fighting Equipment in Metal Mines (M17-1930), which occurred during one of the several recopyings of the code while in the hands of the sectional committee. The error in question occurs in Paragraph 1001 (t). In the standard as published this reads in part as follows:

". . . . and equipped with *40* ft of 3/4 in. air hose . . . ."

This section should read:

". . . . and equipped with *400* ft of 3/4 in. air hose . . . ."

The error and correction are in italics. Users of this code are requested to make this correction in their copies.

Mechanical Refrigeration Code Adopted by Building Conference

The ASA Safety Code for Mechanical Refrigeration (B9-1930) has been adopted by the Pacific Coast Building Officials' Conference and included in its Uniform Building Code. The recommendation for inclusion of the standard in the Building Code was noted in the May issue of the ASA BULLETIN.

Standard for Sieves Needed to Eliminate Confusion

Investigators in many lines have an ever-recurring problem—the determination of the size of particles—with which to contend. Research workers, plant control technicians, and representatives of producers and consumers of materials where size is a factor have the same problem and in general all employ the same method—sieve-testing—to give them the desired information. The technique of sieve-testing in the majority of instances is not complicated and the results are obtained without laborious laboratory manipulation. Where then is the problem? Occasionally it is in the material tested; but more frequently it is in the technique of performing the test and in the very real differences that exist between the testing sieves themselves. Moreover, through custom and usage certain industries use testing sieves with round holes and others use square openings. Confusion is even more pronounced, for instance, in road building where sieves with round openings are used by the highway departments in some states and sieves with square openings in others.

An article in *Rock Products*, May 9, 1931, by Edmund Shaw, entitled "Sieve Testing of Aggregates," discusses the difficulties that arise in attempting to compare and reconcile data on particle size that have been obtained by investigators using different sieve scales. The necessity of standardization and of employing uniform methods and sieves for testing purposes are emphasized. The following excerpt is of particular importance:

> "We ought to have an international system of sieves and an internationally accepted method of making the sieve tests. As it is, few of us know what is meant when we read of the '4900-mesh' sieve used for testing cement in Germany and still fewer know that a British 200-mesh sieve (0.063 mm) is smaller than that used in the United States (0.074 mm) and there is an older 200-mesh (about 0.0544 mm) referred to in older books, that has smaller meshes still.
>
> "It is perhaps too much to hope for that we shall soon have an international sieve system and method of sieve analysis. But a standard method ought not to be impossible in the United States, where the industries represented have powerful national associations and all of them are represented in such specification-making bodies as the American Society for Testing Materials."

This article is of particular interest to the standardization movement at this time as the A.S.T.M. has recently requested ASA to organize a sectional committee to investigate the whole problem. The development of standard specifications of sieves for testing purposes for American technology must necessarily precede the general introduction and acceptance of an international system. However, the two movements may well go forward together, particularly as a movement for international standards for testing sieves is now under way in the International Standards Association, of which body ASA is a member.

H. M. L.

Draft of Window Washing Code Submitted to Committee

The fifth draft of the proposed safety code for window cleaning (A39) has been sent to letter ballot of the members of the sectional committee by C. E. Burns, National Safety Council, Chicago, secretary of the committee.

New methods of installation, materials, etc., have been taken into consideration in preparing the draft, and provisions covering them have been incorporated.

If the draft is approved by the members of the committee, it will be presented to the executive committee of the National Safety Council, sole sponsor for the project, for approval and submission to ASA.

ASA Approves Zinc Coating Standard

A report of the recent activities of the Sectional Committee on Specifications for Zinc Coating of Iron and Steel (G8) appeared in the June issue of the ASA BULLETIN. In this summary mention was made of the action of the sectional committee in recommending that Specifications for Zinc-Coated (Galvanized) Sheets (A.S.T.M. A93-27) be submitted to ASA for approval as American Tentative Standard. Formal submittal by the sponsor, the American Society for Testing Materials, occurred on March 4, 1931. After review by the Board of Examination the standard was ordered to letter ballot by the ASA Standards Council at its last meeting on June 4, 1931. Approval by ASA as American Tentative Standard followed on June 20, 1931. The ASA title and designation of this standard are Specifications for Zinc-Coated (Galvanized) Sheets, G8b1.

J. A. Capp, General Electric Company,

Schenectady, N. Y., is chairman of the sectional committee, and A. B. Campbell, National Electric Light Association, New York, N. Y., is secretary.

Copies of the standard may be purchased at 25 cents each from the ASA Information Service.

Safety Code Committee Elects New Officers

On May 27, 1931, at its meeting held in New York, the Safety Code Correlating Committee elected officers and members of the executive committee for the ensuing year.

The chairman is J. A. Morford, director of the Field Research Bureau of the National Industrial Conference Board. Mr. Morford has been serving during the past 18 months as chairman of the subcommittee on promotion of the use of safety codes in industry.

Walter Paine, director of the Engineering and Inspection Bureau of the Aetna Insurance Company, was elected vice-chairman. Mr. Paine has been a very active member of the committee for several years.

The executive committee, in addition to the officers, includes:

Dr. L. W. Hatch, member, Industrial Board, New York Department of Labor, New York, N. Y.

Dr. M. G. Lloyd, U. S. Bureau of Standards, Washington, D. C.

L. W. Adams, General Electric Company, Schenectady, N. Y.

T. P. Kearns, director, Safety Division, Industrial Commission of Ohio, Columbus, Ohio

W. D. Keefer, director, Industrial Division, National Safety Council, Chicago, Ill.

Coal Mine Transportation Code Approved by ASA

Safety in coal mine operations is a topic of universal interest, pertinent not only to the coal mining industry but also to all who are interested in the preservation of life and property in hazardous occupations. One of the functions of ASA is the development of standards that promote safe and more economical methods in the mining industry. Although the following is not a complete list of mining projects, mention may be made of published standards that cover electrical equipment, car loading, mine drainage, ladders, use of explosives, wire rope, and fire fighting equipment. Another standard—Safety Code for Coal Mine Transportation (M15)—has now been added to the list; this was approved by ASA as American Recommended Practice on June 24, 1931.

The development of safety regulations for coal mine transportation has been in the hands of a sectional committee under the sponsorship of the American Mining Congress since 1924. During this period five complete drafts of the code were prepared before a standard satisfactory to all interests was obtained. In this code, specifications and suggestions are given that cover all phases of coal mine transportation. The code deals with transportation on level and inclined tracks both underground and in the mine yards, and haulage, whether by motors, animals, or men. Complete systems of signals and safety rules are given.

Fred Norman, chief engineer, Alleghany River Manufacturing Company, Kittaning, Pennsylvania, is chairman of the sectional committee which developed the code, and J. M. Hadley, American Mining Congress, Washington, D. C., is secretary. The American Mining Congress is sponsor for the project.

Orders for the standard may be placed with the ASA Information Service and will be filled as soon as copies are available.

International Unification of Fits

In reference to the report on the ISA proposal concerning an international system of standard fits, published on page 3, it is interesting to note that the German national body has spent more than 45,000 marks (about $11,000) on the secretarial work for this project since the beginning of 1927. To this amount should be added the expenses of the other national bodies which have cooperated in formulating the proposal. The expert work and the money spent on this project clearly indicate the importance attached to it by the cooperating countries.

Umbrella Debasement Checked by Purchase Specifications

A recent item in the *Journal of Commerce* cites the difficulties of umbrella manufacturers who, profiting from their experiences in the last few years, are coming to confine their purchases to select umbrella cloths made on a specification basis, said to be necessary

"if only to guard against the debasement of merchandise that invariably results from

the harsh competition that marks trading in these goods.

"Umbrella makers state that they have bought merchandise at substantially reduced prices only to be swamped with returns from retailers. For some time past, manufacturers have been ordering umbrella handles on specification. There is strong likelihood that many will purchase taffetas and similar goods on the same plan in the near future."

Standards for Liquid Soap Again under Discussion

There has been in the liquid soap trade a strong difference of opinion as to whether the trade as a whole is harmed by the sale of numerous substandard products. For example, the view of one representative of the industry, published in the magazine *Soap*, is as follows:

> "Even if every single manufacturer of this association would turn out an ideal grade of liquid soap, it still would only cover a fair percentage of the liquid soap actually purchased by the public. Liquid soaps, in addition, are sold by jobbers and small manufacturers in towns all over the country who use as their raw material cocoanut soap base or concentrated soap syrup. These concerns add as much water as they see fit and sell the resulting product in their cities as a good grade of liquid soap. There are some, of course, who do produce a grade equal to the present specifications. A great many others do not. It seems to us, therefore, that the greater problem is to educate not the members of the association but the jobbers who purchase their soaps and syrups from manufacturers as to just what constitutes a good grade of liquid soap."

The contrary view is evidently held by the editor of *Soap*, who says:

> "On the doorstep of the large buyers rests the cause for present irregularities in liquid soap marketing. Their constant demand for lower prices has almost completely submerged the quality issue. In fact, their demands have encouraged the manufacture of subquality soaps. That the stabilization of liquid soap prices would be to the advantage of all concerned, manufacturers, jobbers, and consumers alike, goes without saying. However, we may prate of stabilization but there will be no stabilization of price or anything else until the quality question is settled. As long as there is fakery in soap content, and as long as buyers will permit themselves to be victimized by this fakery, there is little hope to stabilize either price or quality. The only safe course for the buyer is to place his business with houses of proved integrity and pay them the price."

In another editorial, reference is made to a point brought out during a discussion on liquid soaps at a recent Chicago meeting of the Insecticide and Disinfectant Manufacturers Association that

> "the surface of the potential demand for liquid soaps has not even been scratched. The consumption could be increased many fold, but the increase cannot come under present conditions of wide quality variation, and at any price the traffic will bear. In the first place, the quality of most soaps must be improved very materially.... A dozen vicious practices must be eliminated."

Mr. John V. Halaska, Acme Chemical Company, Milwaukee, Wisconsin, said at that meeting that members of the liquid soap industry should get together and standardize their business as they are losing business due to the

> "sale of cheap products that were of little value to the consumer. They should make a determined drive to enlist the aid of more manufacturers in their program of standardization."

Scope of Project on Grandstands Approved

The scope of the proposed Safety Code for Grandstands (Z20) has been determined by the American Standards Association to be as follows:

> "The design and construction of permanent and temporary outdoor stands and temporary and portable indoor stands for the seating of audiences; stability and strength; volume and facility of exits from the standpoint of flow of traffic and prevention of panic jams; fire hazards and the provision of fire fighting equipment for wooden or other combustible stands; sanitary arrangements; methods of erection of temporary and portable stands."

With this scope in mind the newly elected chairman of the committee, Mr. Kenneth H. Osborn, secretary, Osborn Engineering Co.,

Cleveland, Ohio, who is one of the representatives of the American Society of Civil Engineers, is now appointing the chairmen of the subcommittees which will prepare tentative drafts of various sections of the code. These sections will include the following subjects:

General design and construction
Concrete structures
Portable steel and wooden structures
Permanent steel and wooden structures
Fire protection and exits

The personnel of the committee includes representatives of the following organizations:

American Institute of Architects; American Institute of Steel Construction; American Society of Civil Engineers; American Society for Municipal Improvements; Association of Governmental Officials in Industry; Belmont Iron Works; Circle A Products Corporation; City Managers Association; Dixie Portable Bleacher Company; International Association of Fairs and Expositions; National Association of Amusement Parks; National Association of Mutual Casualty Companies; National Bureau of Casualty and Surety Underwriters; National Collegiate Athletic Association; National Fire Protection Association; National Lumber Manufacturers Association; New Jersey Department of Labor; Ohio Department of Labor; Pennsylvania Department of Labor and Industry; Portland Cement Association; Ringling Brothers, Barnum and Bailey; U. S. Polo Association; U. S. Department of Labor; Virginia Bridge and Iron Company; Wayne Iron Works.

Chairman of Mine Timber Committee Appointed

The American Mining Congress, which is active in the development of standards for safe and improved methods of mining practice, has recently announced that Reamy Joyce, vice-president of the Joyce-Watkins Company, Chicago, Illinois, has accepted the chairmanship of its Mine Timber Committee.

Mr. Joyce, who is a specialist in timber for mining and industrial uses and in wood-preservation methods, plans to treat the problem of mine timbering from a geographical as well as a subject standpoint. Subcommittees are now being organized to study mine timbering from the viewpoint of specifications and practice. Data obtained by these committees should serve as a basis for formulating national standards.

With this program of the American Mining Congress the American Standards Association is cooperating. It is expected that this committee when organized will operate in accordance with the procedure of the American Standards Association in the development of standards.

New Members Appointed on ASA Standards Council

The appointment of the three representatives on the ASA Standards Council, granted the

Sid Whiting Portrait

Worth Rogers

American Railway Association at the meeting of the ASA Board of Directors on December 11, 1930, was completed with the naming of Worth Rogers, superintendent of telegraph, Missouri Pacific Railroad, St. Louis, as representative of the Operating Division of the American Railway Association. Mr. Rogers' appointment was announced at the June 4 meeting of the Standards Council.

Other changes in personnel were announced as follows:

J. E. Saunders, signal engineer, Delaware, Lackawanna & Western Railroad, appointed as alternate representing the Signal Section of the American Railway Association

L. C. Thomson, manager of stores, Canadian National Railway, appointed as alternate representing the Purchases and Stores Division of the American Railway Association

H. A. Kidder, Interborough Rapid Transit, New York City, appointed as alternate, representing the American Electric Railway Association

Standardization as Developed in the New York Edison System

by

G. L. Knight, *Mechanical Engineer*
Brooklyn Edison Company

A review of the significant achievements of the twentieth century will undoubtedly include the intensive use of standardization as an instrument of human progress. The extent to which this work has already influenced our industrial régime is but little realized, but already it is bearing fruits which justify the costs of its application.

Quoting Magnus W. Alexander, president of the National Industrial Conference Board,

> "The rapid industrial growth of the last two decades, particularly in the United States, may be said to be based largely upon the partly unconscious, partly deliberate, extension and refinement of industrial standardization; and the influence of this process is felt today in every aspect of American business life."

In August, 1928, Matthew S. Sloan, then president of the Brooklyn Edison Company, Inc., testified before the Public Service Commission that if the electrical companies in Greater New York were united into one system, a very large saving in operation would result. This saving would be passed on to the consumer. Shortly after this announcement the consolidation of The New York Edison Company, the Brooklyn Edison Company, Inc., The United Electric Light and Power Company, the New York and Queens Electric Light and Power Company, and The Yonkers Electric Light and Power Company was approved and Mr. Sloan was elected president of each of these companies, the group becoming known as The New York Edison System.

Mr. Sloan immediately set out to make good his promise of reducing the operating expense of these companies and he foresaw that one way of effecting such economies lay in the direction of standardizing the internal operations of the various units under his control so that they could function smoothly and in step with each other as inter-related units within the same organization. His idea was to select the best methods in each company and apply them as standards for all.

With this end in view he appointed on October 16, 1928, a "Technical Advisory Committee" to advise him on all technical matters relating to the development and operation of the plants in the affiliated companies. Quoting from a part of his letter of instruction to this committee,

> "The standardization of materials and requirements is essential to the most economical operation of stores and coordinated purchases on competitive bidding and this committee is instructed to view the operations of the entire system to insure these results."

Two weeks later an "Accounting Advisory Committee" was organized to accomplish the same thing with relation to methods of accounting used throughout the affiliated companies. These two committees were composed of officers and department heads of the various companies, with Mr. Sloan as chairman, and they have functioned continuously since their inception.

In addition to these committees, the president appointed also three technical standing committees, known as the Electrical Standing Committee, the Mechanical Standing Committee, and the Joint Electrical and Mechanical Standing Committee, all reporting to the Technical Advisory Committee; and the General Accounting and the Consumers Accounting Committees reporting to the Accounting Advisory Committee.

These main or primary committees soon organized various working and subcommittees to study and report on various matters as assigned specifically to these committees.

The personnel of these committees consists in general of those members of the organization most familiar with the particular work assigned.

Wherever possible, existing national standards have been used. Contact was made with other organizations working along similar lines such as the Detroit Edison Company and the Westinghouse Electric and Manufacturing Com-

pany. Their response was generous and much valuable data has been collected.

A survey of the field to be covered indicated that a very large amount of work is being done by the American Standards Association, the American Society for Testing Materials, the American Society of Mechanical Engineers, the U. S. Government, and many other national organizations, the results of which are available to everyone. It was found that many standards had already been set up by these organizations, the use of which would insure the obtaining of an improved quality of material.

Committees Recommend Standards

A Mechanical Specification Committee and an Electrical Specification Committee were appointed to review and recommend standard specifications for mechanical and electrical equipment being bought by the various purchasing agents of The New York Edison System. These committees are composed of representatives from the engineering, the research, and the purchasing departments of the various companies, thereby insuring a broad and comprehensive viewpoint.

The need for a specification covering a particular material is communicated to one of these specification committees by the department involved. An investigation is then made to determine whether or not there is a national standard in existence which will meet the requirements. If such is the case, it is carefully reviewed with the idea of adopting it *in toto*, as it is considered advisable from a purchasing standpoint to have as few exceptions as possible to standards which are already recognized by manufacturers. However, if the contemplated use of the national standard indicates that a change in it would prove beneficial, such change is made by adding or omitting the desired clauses rather than by rewriting the standard.

Where no national standard exists for a particular material, an Associate Committee is formed to study the problem and to formulate a proposed standard for presentation to, and approval by, the parent specification committee. The aid of recognized manufacturers and contractors is often solicited in the preparation of such a standard and the response has always been both prompt and helpful. In all cases the specification committee, after adopting a standard, forwards it to all interested departments within the system for comments. When all comments have been considered and concurrent approval has been obtained, the standard is submitted to the parent standing committee and in turn to the Technical Advisory Committee, whereupon, if approved, it is designated an official standard by the president and as such is printed and distributed throughout The New York Edison System. Deviations from these standards are made only with the approval of the first executive officer of the company desiring to make the deviation, and even then the concurrent approval of the parent standing committee is necessary.

A considerable saving is effected in the cost of preparing specifications for construction jobs since only the special features applying to each particular job need be covered in the job specification and the large part of the job can be covered by the standard printed specifications for materials, workmanship, testing, inspections, etc. This method also lessens the chances of omissions through oversight of important requirements.

The foregoing discussion has been confined only to the treatment of standards of materials as it is in this connection that contact is made with the American Standards Association, but much valuable work is being done also along other lines. Studies are being made resulting in the standardization of construction methods such as the making of cable splices, and the installation of various types of service required for tall buildings and apartment houses. Investigations are being made and recommendations submitted for the application of standards in system operation, including revised schedules of operation, new systems of numbering and tagging feeders, etc. At the same time there are comprehensive studies being made as to the most effective methods of accounting to be used by the companies, the recommendations running all the way from a standard form of service application to a standard payroll check, and from a common style and quality of letterhead to a prescribed messenger envelope.

Some conception of the work done to date on the adoption of standards of material alone, during the past two and one-half years, may be gained from the accompanying table which lists those materials for which company standards have already been accepted.

Standards Result in Savings

The various kinds of bolts formerly purchased by the companies have been reduced to two: common bolts for ordinary uses, and alloy steel bolts for high temperature service. The sizes and types of cable have been reduced from approximately 500 to 134, resulting in an estimated annual saving of $725,000. The adoption of standards for these two materials alone not only has greatly reduced the amounts held in stock, thereby effecting economies in storeroom facilities and personnel, but also has resulted in the securing of better quality than was heretofore the case.

Savings have been effected in purchases with a resulting reduction in the amount of materials

carried in storage for such materials as boiler compounds, cleaning fluids, fire extinguishing liquids, cleaning and wiping cloths, solders, bearing metals, reinforcing bars, hack-saw blades, etc.

No attempt has been made to list all the constructive recommendations made in accounting practices or system operation methods which have been adopted, as they are so diverse in scope as to render a comprehensive classification difficult. However, it can be safely said that these inter-company committees have already brought forth recommendations, the adoption of which has gone far toward bringing the five erstwhile independent companies into closer relationship.

That both the leading industries and the largest manufacturers of the country realize the value of buying and selling according to carefully prepared specifications is evidenced by their rapidly increasing use. The more uniform these specifications become and the greater the use of national specifications, the greater will be the savings to manufacturers.

The aim of The New York Edison System standardization work, broadly stated, is to secure unification of design, operating, purchasing, and stores and accounting practices to secure maximum economy in all company operations.

The following standards used by The New York Edison System are sponsored by the Mechanical Standing Committee:

Material Specifications

Cast-iron pipe flanges and flanged fittings
Malleable-iron screwed fittings
Cast-iron screwed fittings
Steel pipe flanges and flanged fittings
Gray-iron castings for general use
Cold-drawn steel wire for concrete reinforcement
Steel springs for pipe supports
Brass pipe, standard sizes
Portland cement
Standard methods of sampling stone, slag gravel, sand and stone block
Cast-iron pipe
Carbon-steel castings for valves, flanges, and fittings for high temperature service
High-test gray-iron castings
Malleable castings
Steel castings for general use
Black and hot-dipped zinc-coated (galvanized) welded and seamless steel pipe for ordinary uses
Lap-welded and seamless steel pipe for high temperature service
Lap-welded and seamless steel and lap-welded iron boiler tubes
Seamless admiralty condenser tubes and ferrule stock
Carbon-steel and alloy-steel forgings
Billet-steel concrete reinforcement bars
Rail-steel concrete reinforcement bars
Alloy-steel bolting material for high temperature service
Naval brass rods for structural purposes
Muntz metal condenser tube plates
Structural steel
Red lead
Raw linseed oil
Boiled linseed oil
Basic carbonate white lead
Gum spirits of turpentine and steam-distilled wood turpentine
Hack-saw blades
White metal bearing alloys (known commercially as "Babbitt Metal")
Trisodium phosphate (phosphate cleaner)
Petroleum spirits (mineral spirits)
Fire extinguishing liquid (carbon tetrachloride base)
Common steel machine bolts

General Building Specifications

Test borings
Demolition
Excavation

The following standards used by The New York Edison System are sponsored by the Electrical Standing Committee:

Material Specifications

Impregnated paper insulated, lead covered cable
Creosoted wood conduit
Friction tape
Rubber insulating tape
Rubber bandages
Galvanized steel strand
Goggles for protection against flying particles
Goggles for protection against dust
Goggles for welders
Welders' hand shields
Glass for boiler fire inspection
Solder
Hickory tool handles
Digging spoons—shovels and handles
Digging bars
Cant hooks and handles
$^1/_2$-inch and $^3/_4$-inch pneumatic hose (non-armored)
Manila rope
Dry cells and batteries
Black varnished cambric tape
Ladders
Rubber line hose
Rubber blankets
Pike poles
Impregnated paper tape
Weatherproof (weather resisting) wires and cables
Hard-drawn copper wire

Medium hard-drawn copper wire
Soft or annealed copper wire
Tinned soft or annealed copper wire for rubber insulation
Bare concentric—lay copper cable hard, medium—hard or soft
Western red cedar poles
Creosoted southern yellow pine poles
First-aid equipment
Smooth rubber matting for use around electrical apparatus
Corrugated insulating mats
Linemen's rubber shields
Rubber sleeves
Rubber gloves for use on apparatus or circuits not exceeding 3000 volts to ground
Varnished cambric insulated cables
120/240 volt cable joints
4000 volt cable joints
15,000 volt cable joints
Tinned copper connections for use with solid and stranded copper conductors
Lead sleeving
Paraffin
Cotton fabric insulating tapes
Cotton sleeving
Tarred marline
Insulating cotton wicking
Lead crotch pieces for cable joints
Copper plates for concentric cable joint
Wooden jacket for concentric cable joint
Paper pasters
Asbestos wicking
Galvanized iron wire for use in cable joint
Plastic cable splicing compound
Copper mesh tape
Semi-fluid joint filling compound (petrolatum)
27,000 volt cable joints
Metal cones
Rubber insulated cable
Leather protectors
15 kv cable terminals
27 kv cable terminals
45 kv cable terminals
132 kv cable terminals
45,000 volt cable joints
132,000 volt cable joints
Buried non-magnetic sheath cable
Vertical distribution cable
Tree wire
Transformer manholes

Electrical Instructions

Retests of rubber gloves
First-aid rooms
Retest of rubber insulating protective devices other than gloves and sleeves
The retest of rubber sleeves
Use of insulating protective devices
Testing of insulated tools
Tests on rubber sheathed portable cords
Method of identifying high tension cables in manholes
Installing transformer poles
Insulating terminal chambers of distribution transformers
Arc-proofing cables

The Robot and the Engineer

The robot is the modernistic conception of the Frankenstein monster, and, in the mind of the alarmist, bids fair to destroy its master.

The word "robot" might well apply to any labor-saving device or scheme; and tendencies toward standardization and unit-type equipment and methods might be called a "robotic" trend.

The aim of standardized construction is to cut engineering and design expense, and construction labor costs. If cross arms are always installed in the same way—if lightning arresters are always placed the same distance from line insulators—if transformer arms are always in the same gain position, and transformers always hung facing away from the station feed, the workmen become so accustomed to these "standards" that design and supervisory work are reduced to a minimum.

In common with other utilities throughout the country, this company has been actively working on Overhead Construction Standards for the past two and one-half years. This work is even now only in its infancy, because various types of equipment now in use have been found inadequate for present and future use, and the men in charge of the standardization are developing, by their own initiative, newer and better equipment and methods.

The Estimator, who formerly required a new design for each job, now refers to Construction Drawing No. Blank, and sends in the estimate, knowing that the job will be built according to the drawing from which he got his material cost.

Changes in equipment, and changes in design or construction methods, are made after submitting proposals to the interested Departmental Heads, and including in the standards the consensus of opinions.

Each Departmental Head, each Estimator, and each Line Foreman has a standard, and since all books are kept up to date and identical, it has become a kindly "robot" that helps hold down construction costs and relieves the entire organization of a troublesome "chore."—*Reprinted from the May, 1931, issue of the Synchronizer, a publication of the Louisville, Kentucky, Gas and Electric Company.*